The New Zealand

Journal of Agriculture.

VOL. 41. WELLINGTON, 20TH AUGUST, 1930. No. 2.

THE GRADING OF MILK FOR CHEESE MANUFACTURE.

H. R. WHITEHEAD, Bacteriologist, Dairy Research Institute (N.Z.), Palmerston North.

THE process of cheese manufacture depends to a large extent on the action of bacteria. They are responsible for the necessary acid-production throughout the actual manufacturing process, and play an essential part in the ripening of cheese. All bacteria do not, however, act in the desired manner. Some produce unclean flavours, and are the cause of other undesirable conditions in both milk and cheese. Hence the cheesemaker prefers to have, as his raw material, milk which contains as few bacteria as possible. Those bacteria which are desirable can be added to the milk in the form of a starter culture, and the absence of undesirable germs in the milk is an insurance against trouble during manufacture and against unclean flavours in the cheese.

Pasteurization was originally introduced as a means of controlling the activities of undesirable bacteria which had gained access to the milk owing to unclean methods of handling. But pasteurization is only a partial corrective, for two reasons: firstly, the bacteria may have already produced chemical changes in the milk; and, secondly, milk, unlike cream, cannot be heated to a temperature sufficiently high to ensure destruction of all bacteria without altering its taste and chemical properties. In a badly contaminated milk there still remains after pasteurization a sufficient number of living organisms to be a potential source of trouble.

Hence if the best-quality cheese is desired it is necessary, despite pasteurization, to insist that the supply of milk shall be as free from bacteria as possible. Human nature being what it is, practically the only way to achieve this end is to institute a system of payment for milk according to its bacteriological quality, as well as for its quality as judged by the senses. The factory-manager already practises a very lenient grading. He rejects milk which is objectionable to the smell or taste. This system must still obtain under any grading system, but in addition some test is necessary which will give an estimate of the number of bacteria in the milk. The present article is a consideration of the various methods of grading and the best methods of applying them.

It should be emphasized at the outset that there is no method which will serve to determine accurately the number of organisms present in a sample of milk. Several methods, however, give estimates which are sufficiently reliable for the purpose of milk-grading. So far as commercial application is concerned, therefore, the main points to be considered are simplicity and cheapness, for it would be quite possible to spend more in carrying out milk-grading than the industry would gain from the improved quality of the final product.

There are three methods commonly applied to the determination of bacteriological quality in milk—namely, the direct microscopic count (Breed method), the plate count, and the methylene blue reductase test.

The plate count is carried out by mixing definite small quantities of the milk with a special jelly (agar) in which the bacteria thrive. When the agar is incubated at 37° C. (98° F.) each germ reproduces by dividing, and continues to do so until it has produced millions of its kind, thus forming a colony of bacteria which can be seen by the naked eye. After incubation for two days, the number of colonies is counted, and thus an estimate of the number of bacteria originally present in the milk is made. This method can be dismissed from consideration for the present purpose on account of the expense of its application both in materials and time. The other two methods have both been successfully applied to the examination of milk supplied to cheese-factories, and it is proposed to discuss their relative merits and to indicate how they could be applied on a national scale.

The Direct Microscopic Count (Breed Method).

Practically the only apparatus needed for carrying out the direct count is a microscope and its accessories. The microscope is costly (£20 to £30), but it has a long life and costs nothing for upkeep. The milk-samples can be taken and the slides prepared on the factory receiving-stage, and the examination can then be carried out at any convenient time. Alternatively, an antiseptic, such as phenol, can be added to the samples as they are taken, and they can then be sent to a central laboratory for examination.

The samples are prepared for examination by spreading $\frac{1}{100}$ of a cubic centimetre (about $\frac{1}{3000}$ of an ounce) of the milk over an area of one square centimetre on a microscope slide. After the milk has been dried on the slide the fat is removed with a suitable solvent, and the film is treated with a blue stain which colours the bacteria so that they can be easily seen under the microscope. The stained milk smear is then examined under a microscope which has been adjusted so that the area seen in each field is known. This area is usually $\frac{1}{3000}$ sq. cm., or one three-thousandth of the total area of the milk smear. The bacteria seen in thirty successive fields are now counted and the average number per field is found. It is now possible to calculate the number of bacteria in 1 c.c. of the original milk. For instance, suppose the average number per field is five, the number of bacteria in the whole milk smear is $5 \times 3{,}000 = 15{,}000$. The milk smear was prepared from $\frac{1}{100}$ c.c. of milk; therefore the number of bacteria in 1 c.c. of milk $= 15{,}000 \times 100 = 1{,}500{,}000$. The slide can be kept for future reference if required. It is thus possible to demonstrate to a farmer the condition of his milk on any particular day.

A disadvantage of the method is that it is not possible to distinguish between dead and living organisms, nor is it possible to predict how rapidly the bacteria will multiply in the milk. Some of them may be of slow growth and hence of comparatively little importance, but the Breed method does not permit of any discrimination. The method has the advantage that an experienced observer can sometimes recognize certain bacteria by their shape and arrangement, and hence can deduce the sources from which the milk became contaminated. Emphasis must, however, be laid on the fact that *considerable* experience is necessary before reliable deductions can be made in this way.

With regard to the technique of the examination, it is obvious that it takes an appreciable time to count the bacteria seen in thirty fields, and that it would hardly be possible for one person to grade fifty milk-samples in a day. For this reason some workers have adopted a modification of the method whereby an estimate of the number of bacteria is made after a rapid examination of the milk smear under the microscope. Using this modification, it is said to be possible to examine two hundred samples in a day. In the following discussion it will be assumed that this modification is to be used.

The Methylene Blue Reductase Test.

The methylene blue reductase test is still more simple. The most expensive part of the apparatus is a water bath fitted with a thermostat, which costs £6 to £10. Samples of milk are taken on the factory receiving-stage. A definite quantity of each milk (10 c.c., 20 c.c., or 40 c.c.) is measured into a clean dry test-tube. One cubic centimetre of methylene-blue solution is added, and the tubes are incubated in the water bath at 38°–40° C. (100°–104° F.). The dye solution is of such a strength that in the mixture of milk and methylene blue there is one part of dye in 200,000 parts of fluid. The tubes are examined from time to time, and the period required for decolorization or bleaching of colour is noted for each sample. This time varies with the number of bacteria present in the milk-sample. A milk of poor sanitary quality, containing large numbers of bacteria, will rapidly bleach the dye, whereas a milk containing few bacteria will remain blue for seven hours or longer. In practice, of course, it is necessary to examine the tubes only at those times which are the limits of the different grades of milk.

The method suffers from the disadvantage that all organisms have not the same decolorizing power, and consequently the reduction time is no more than a rough measure of the number of germs present in the milk. This is one reason why it is impossible to obtain more than a very imperfect correlation between this test and the direct count. On the other hand, only the living bacteria can affect the methylene blue, and their rate of growth and effects one upon another are factors which are reflected in the result of the test. Furthermore, the test has a definite end-point about which there can be little disagreement, whereas an estimation by the modified direct count introduces a personal factor which can easily lead to disagreement between the results of different observers. Especially is this the case where bacteria exist in clumps and chains in the milk, for the germs may be very unevenly distributed in the stained smear, and it is then difficult to make a reliable estimate by the microscopic method.

Extension of Reductase Test; Fermentation Test.

The extension of the reductase test into the so-called fermentation test (by incubation of the sample for twenty-four hours) gives still more information about the types of bacteria present in a milk-sample, and it is possible to detect the presence of germs capable of producing undesirable flavours. Deductions made from observation of the physical properties of the curd produced are less reliable, and it is doubtful whether any material advantage can be gained by taking the type of curd into account in grading a series of samples of milk. For instance, a milk containing very few bacteria rarely gives a smooth curd, although the number of undesirable organisms present is much too small to cause trouble in cheese manufacture. A heavily contaminated milk, on the other hand, often gives a smooth curd in spite of the probability that it contains many organisms capable of exerting an adverse influence on cheese.

The Wisconsin curd-test, in which a curd is produced by the addition of rennet to the milk, is a much more reliable means of determining the potentialities of a given milk in the cheesemaking process, but it would hardly be possible to use it regularly to grade the milk of all suppliers. It should be reserved as a supplementary test in special cases.

Practical Methods capable of General Application.

The fact that there is not an accurate correlation between the results of the reductase test and of the direct count is really of little moment, for it is obvious that the application of either test, combined with differential payments, will stimulate an improvement in the sanitary quality of the milk. The methylene-blue test has probably a slight advantage in that it is carried out under conditions which more closely approximate to those obtaining in the cheese-vat, but the main factor in any choice between the two methods must be the practicability of application on a national scale.

Whichever method be chosen, it will be impossible under present conditions to grade the milk-supplies of a given factory daily, and probably three tests of each supplier's milk in a ten-day period will be the maximum practicable. Some factories might find it impossible to carry out the grading more than once in each period. No more than three grades are necessary, and the writer is of the opinion that, at the outset, two grades would serve the purpose and at the same time simplify matters. For instance, if the reductase test is to be used, three hours might be taken as the dividing-line between the two grades. It would, of course, be valuable to make a note of those samples which decolorized in less than one hour, so that the farm dairy instructor could visit the worst farms as soon as possible; but all samples which decolorized within three hours should be relegated to the lower grade. It is relatively easy to produce milk with a reduction time of more than three hours, and yet there are at present many suppliers whose milk gives a result well below this figure. Probably the standard could profitably be altered during the colder months, when five hours might be adopted as a standard. According to the results of several workers, these reduction times would correspond roughly to counts of 8 to 10 millions and 2 to 3 millions per cubic centimetre respectively by the direct count, so it is evident that the standard set would not be particularly high.

It should be emphasized at this point that, whatever the system of grading, the factory-manager must always have the power to lower the grade of any milk which is objectionable to the senses and yet gives no indication of inferior quality in the test. It is evident that there are objectionable qualities, such as feed flavours, which no bacteriological test will detect. On the assumption that the grading is carried out three times during a ten-day period, it is suggested that a supplier would be paid on a first-grade basis if two of his samples were graded first; if two of his samples were graded second he would be paid on that basis for the whole ten days.

The next point to be considered is whether the grading tests should be carried out by factory employees or by some independent grader. It would probably inspire more confidence in the minds of suppliers if the second method were adopted; but in this event grading would be a more costly procedure, for one tester could hardly deal with more than three or four factories. Here, again, the method to be used must be taken into consideration. The methylene-blue test could best be conducted by some one in each factory, since it is necessary to examine the tubes at intervals (depending on the standard times adopted). If the direct count were used, on the other hand, an independent tester could prepare slides from the milk on the receiving-stage and then take them to a central laboratory for examination. Alternatively, he could have a small laboratory fitted up in a motor-van. It would be quite possible for some one on the factory staff to carry out the direct count; but the examination would consume most of his time during the day, and it would be difficult in many factories to find a place suitable for microscopic work.

A consideration of all these points leads one to the conclusion that the most practical way of grading milk at the present time is to adopt the methylene-blue test as a standard procedure, and to delegate one employee at each factory to carry out the test. Possibly the employee who at present checks the standardization in many factories could look after the milk-grading also. In instances where anomalous results were obtained with the reductase test, and where there would appear to be peculiar conditions on some farm, it would be possible to have a more detailed examination of the milk carried out in a laboratory with a view to deducing the cause of the trouble.

Procedure recommended for conducting the Methylene-blue Test.

APPARATUS REQUIRED.

(1) *Metal Water Bath with some Arrangement for maintaining a Constant Temperature of 38°–40° C. (100°–104° F.).*—A spirit-lamp or gas-flame may be used to heat the water bath, but an electric heating-element controlled by a thermostat is better. An electrically heated bath capable of holding forty-eight tubes can be obtained from Messrs. Chas. Hearson and Co. for about £10. The water bath should on no account be fitted with glass sides, as erroneous results may be obtained due to a decolorizing action of sunlight on methylene blue in milk.

(2) *Tubes.*—These should be fairly strong, and should be of such a size that 20 c.c. of fluid fills them to a point about 1½ in. from the top,

so that the contents can be easily mixed by inversion of the tubes. Tubes with a length of about 6 in. and a diameter of $\frac{5}{8}$ in. are suitable. The tubes should have a sand-blasted area on the side, where the supplier's number can be written.

(3) *Measures.*—Some apparatus for measuring 20 c.c. of each milk-sample is necessary. A small dipper holding exactly 20 c.c. is the most convenient device. A 1 c.c. pipette is needed for distributing methylene-blue solution into the test-tubes.

(4) *Methylene-blue Solution.*—The correct solution contains one part of dye in 10,000 parts of water. 1 c.c. of this solution added to 20 c.c. of milk will give a dilution of methylene blue in milk of 1 in 200,000. The dye solution can be prepared either from Blauenfeldt and Tvede's tablets or from powdered methylene blue of guaranteed purity. Powder containing 89 per cent. of methylene blue can be obtained from Arthur H. Thomas Co., Philadelphia, U.S.A. The tablets give a solution containing 1 part of dye in 10,000 parts of solution when one tablet is dissolved in 400 c.c. of water. Distilled water (condensed water from a pasteurizer) should be used for making the solution. The solution is stable for a considerable time, but in order to avoid the use of solution contaminated with traces of water from the pipette it is perhaps advisable to make up a stock solution of 1 in 2,500. Portions of this can be diluted with three parts of distilled water at fortnightly intervals to give a dilution of 1 in 10,000.

THE ACTUAL TEST.

The milk-samples are collected on the receiving-stage by dipping 20 c.c. of milk from the weighing-vat into tubes which have recently been cleaned and dried. The supplier's number is marked on each tube. The dipper should be washed in warm water after each sample is taken. Alternatively, larger samples of milk may be taken in clean bottles, the bottles being cooled in water until all the samples have been collected. The quantities required for the test can then be taken from the bottles.

Where the samples are placed directly in the tubes, the tubes should be either cooled in water or the methylene blue should be added and the test started on batches collected within half an hour or one hour. The underlying idea with either system is to avoid the unfairness which would result if certain samples were allowed to remain uncooled for some time before starting the test. When all the samples, or a batch of samples, have been filled into tubes, 1 c.c. of methylene-blue solution is added to each sample. *The methylene blue should on no account be placed in the tubes before the milk, since the dye stains glass very readily and it is almost impossible to remove the stain.*

The contents of each tube are mixed by closing the mouth with a finger and inverting it. The finger should be wiped before the next tube is inverted, in order to avoid the mixture of one milk with another. All the tubes are then placed in the water bath and the time is noted. An examination is made at the requisite times, and those samples which show a return to the normal colour of milk are noted as reduced within the particular time-limit. Slight traces of blue persisting at the top or bottom of a sample may be ignored.

Samples occasionally show a patchy decolorization. In these instances the tube may be rotated gently in the hands, and is to be regarded as decolorized if the blue is not distinct enough to be detected after the contents have been mixed in this way. *In no case is it permissible to invert tubes and shake the contents after the first admixture of the blue, for it is possible to restore the blue colour to any decolorized sample by shaking with air.*

CERTIFICATION OF SEED POTATOES.

REVIEW OF OPERATIONS FOR SEASON 1929–30.

J. H. CLARIDGE, B.Agr., Assistant in Agronomy, Department of Agriculture, Palmerston North.

SEED-POTATO certification in New Zealand was established by the Department of Agriculture in 1927, and for the benefit of new readers a brief outline of the scheme is given before proceeding with the season's review.

The object aimed at in certification is to place before merchants and growers information which will enable them to obtain seed potatoes which are true to name, reasonably free from tuber-borne diseases, and capable of producing a satisfactory yield. Applications are invited from growers, and a sample of 150 tubers is collected from the seed they intend to plant. These samples are grown by the Department of Agriculture under uniform conditions so that the growth and yield of the different samples of a variety may be compared one with another.

During January or February the grower's crop is subjected to a first field inspection. When the shaws have commenced to die down the second field inspection is undertaken, and the seed-tuber produce of the crop is again inspected when bagged and ready for sale. If a crop passes the necessary standards, the grower is issued with sufficient certification tags to enable him to attach one tag to each bag of certified seed he has for sale, and at the end of the season he is issued with a certificate.

During the past season potato-certification has been in operation throughout the Dominion, though the great majority of the crops have been grown in the South Island. The following figures give the number of applications for certification received from the different districts :—

Otago and Southland	65
Canterbury and Marlborough	310
Manawatu and Hawke's Bay	5
Auckland	28
Total	408

These figures show a marked increase over that for the 1928–29 season, when a total of 180 applications was received from the South Island. (There was no potato-certification in the North Island in that season.)

CROPPING-POWER.

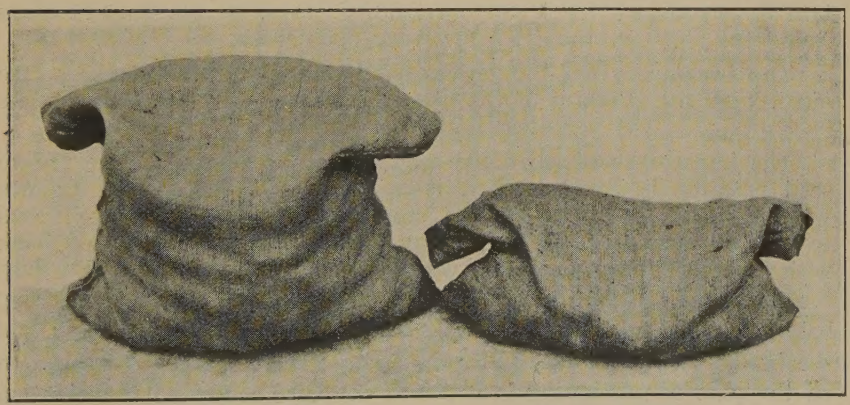
In the review of operations for 1928–29, published in the *Journal* for June, 1929, particular stress was laid on the importance of the cropping-power of various lines. It is desired to again emphasize the importance of this characteristic; in fact, so much weight is accorded to it that this year, in conjunction with the list of growers whose crops had been provisionally certified, the cropping-power of each line was given. (See *Journal* for May last, page 354.) In this way a farmer can know the relative cropping-value of the seed he is purchasing compared with other lines of the same variety.

Table 1 indicates the cropping-powers of the various lines in the certification trials. The term "cropping-power" may perhaps need explanation again. This figure is obtained by adding together the yield of table tubers and half the yield of seed tubers, and converting the results into tons per acre. Thus, while in these figures "seed" is given a certain value in the crop it is only half that given to "table," which seems more desirable than either placing seed at the same value as table, or, on the other hand, giving it no value whatsoever.

Table 1.—Cropping-power of Lines of Potatoes in Certification Trials, Season 1929–30.

Variety.	Number of Lines.	Range of Cropping-power in Tons per Acre.	Average Cropping-power in Tons per Acre.
Dakota	107	11·6 – 1·7	6·7
Iron Duke	7	10·8 – 3·1	6·2
Aucklander Short-top	63	14·4 – 3·1	7·6
Aucklander Tall-top	19	14·0 – 3·3	9·1
Arran Chief	30	10·6 – 2·2	6·3
King Edward	21	8·8 – 4·5	7·2
Bresee's Prolific	15	6·8 – 3·7	5·2
Epicure	15	9·7 – 0·5	3·8
Up-to-date	16	11·5 – 2·2	5·9
Field Marshal	3	10·5 – 5·3	8·3
Majestic	11	8·0 – 1·9	5·2
Northern Star	4	9·4 – 6·9	7·8
Endurance	4	13·5 – 4·6	8·8
Jersey Bennes	6	6·4 – 1·6	4·1
Early Regent	3	3·6 – 2·7	3·1
Great Scot	3	5·5 – 2·2	3·6
Robin Adair	2	6·5 – 5·9	6·2
Golden Wonder	2	6·1 – 3·8	4·9
Reading Russet	2	9·1 – 7·9	8·5
Shamrock II	2	7·3 – 6·1	6·7
Maori Chief	2	9·3 – 9·2	9·2
Early Rose	1	11·5	..
North Downs	1	4·1	..
Kerr's Pink	1	3·0	..
Sharpe's Express	1	1·4	..
Witchill	1	0·8	..
Eclipse	1	1·6	..
Arran Victory	1	5·5	..
Cliff's Kidney	1	3·4	..
Brownell's Beauty	1	10·4	..

FIG. 1. VARIATION IN VIGOUR, DUE TO MOSAIC INFECTION, IN TWO LINES OF EPICURE POTATOES ENTERED FOR CERTIFICATION TRIAL.



9·7 tons per acre. 3·2 tons per acre.

FIG. 2. RESPECTIVE YIELDS FROM THE TWO LINES OF EPICURE SHOWN IN FIG. 1.

[*Photos by J. Claridge.*

The trials in the past season were much elaborated in order to determine the cropping-powers with greater accuracy. This entailed the planting of ten small plots (ten tubers each) at the local trial area (Gore, Ashburton, or Palmerston North, as the case might be) and four similar plots at the central trial area at Palmerston North. Thus for each crop entered in certification there were fourteen small plots under close observation and trial. In addition, the plots were so arranged that each was growing immediately alongside a similar sized plot of a standard line for comparison of yield, this same standard line being used throughout all the trials.

It is essential to remember that even now the trials are not absolutely accurate; in fact, differences of half a ton are not reliable, those of 1 ton give only an indication, while it takes differences of at least 1½ tons to be really reliable. Even so, in glancing down the yields obtained from any one variety it is easily seen that some crops are definitely better than others, and it is only the higher-yielding lines which are being certified.

No cropping-powers of the lines from the Auckland district are being published. This is on account of the system of double cropping and resultant uneven maturity in the seed planted in December affecting the yields. While certain crops could be picked out as being definitely better than certain others, it would be unfair to attempt to place the crops in any order of merit on the results obtained. It was decided, therefore, to omit all yields of these lines from the list. Suffice it to say that the lines which have been entered from the Pukekohe district are, on the average, of a much higher standard of cropping-power than lines of the same varieties entered from other districts.

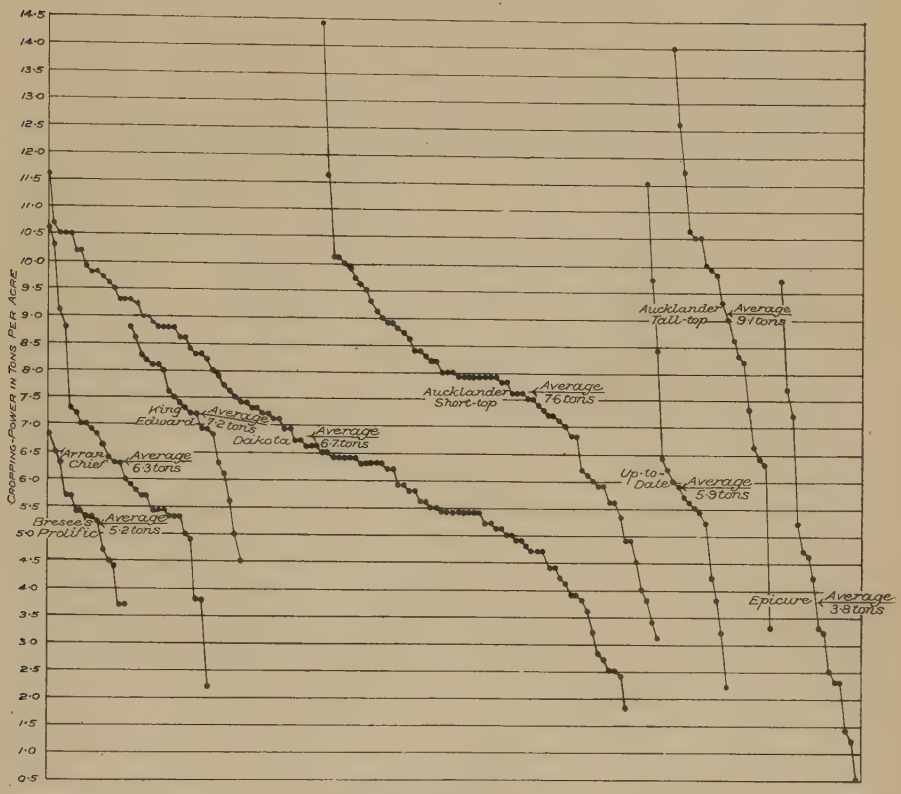
Range of Yield.

Graph 1 represents the range of yield of several of the more important varieties. In connection with these it is interesting to note that there is a tendency for the lines of any one variety to be divided into three groups: (1) A few outstanding crops, (2) the bulk of crops round the average, and (3) a few very poor crops.

The Aucklander Tall-top variety has again given the highest average yield, with the averages of the other main-crop varieties more or less in a group, as was seen last year.

The importance of what one might term "pedigree" in regard to seed potatoes is stressed when it is mentioned that in the Dakota variety of the thirty-four highest crops in the list, yielding from 11·6 to 7·6 tons per acre, no fewer than twenty-four can be traced back with certainty over the last two seasons to one grower. Further, there is no seed which can be traced to this grower which is recorded below this point in the list. The variation between the highest and the lowest yield in these twenty-four crops is due largely to selection on the part of purchasing growers on the one hand and the planting of second-grade seed on the other.

To further stress the importance of pedigree, taking the same variety, two lines traced back to another grower yielded 5·5 tons and



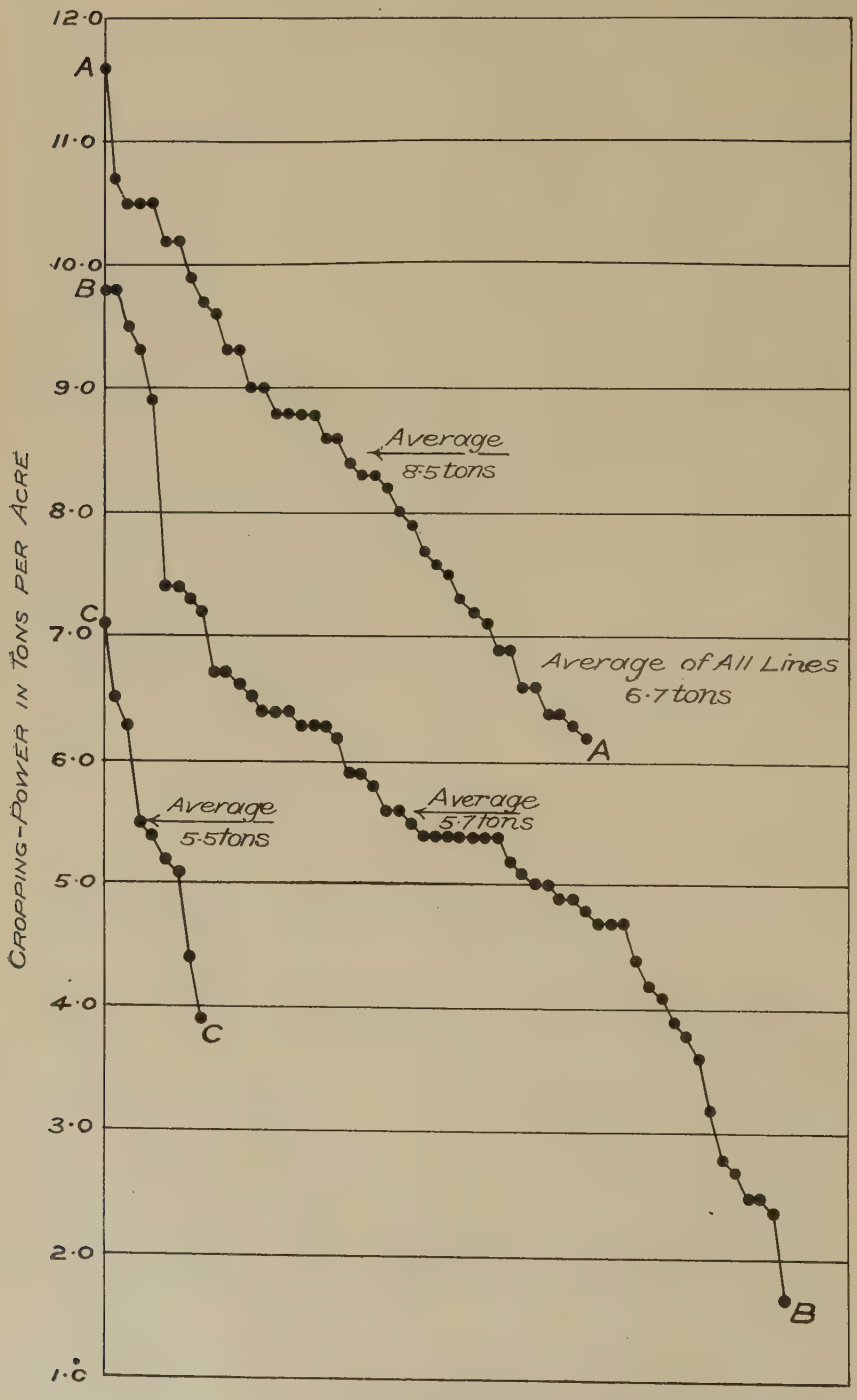
GRAPH I. RANGE IN CROPPING-POWER SHOWN BY LINES OF THE MORE IMPORTANT POTATO VARIETIES UNDER TRIAL, SEASON 1929–30.

5·4 tons respectively, while five lines traced to a third grower yielded from 5·4 to 7·5 tons. Other and similar examples could also be drawn to illustrate the same point.

The advantage of planting certified over uncertified seed is shown in Graph 2, where the lines of Dakota have been divided into three groups as follows: (1) Those lines which were provisionally certified last year and were again under trial this year; (2) those lines not previously under trial; (3) those lines under trial and rejected last year and again under trial this year. (NOTE.—One or two of those under the last category were passed for cropping-power in the previous year, but were rejected on account of eelworm or powdery scab.)

No explanation is required to show the advantage of using certified seed. A grower may purchase a line of uncertified seed equal to the best certified line, but, on the other hand, one can easily see from the graph that should he purchase uncertified he is more likely to strike a line which yields below even the lowest yielding certified line.

It is interesting to record that for the third year in succession the premier position in both Dakota and Up-to-date has been occupied by the same grower—an outstanding performance. Two other growers have topped the list in Aucklander Tall-top and Epicure respectively



GRAPH 2. DAKOTA YIELDS, SHOWING DIFFERENCES BETWEEN CERTIFIED AND UNCERTIFIED SEED.

A. Crops provisionally certified in 1928–29 and again entered in 1929–30.
B. Crops entered in 1929–30, but not entered previously.
C. Crops rejected in 1928–29 and again entered in 1929–30.

for the second season. The Aucklander Short-top list is headed by an outstanding line which was not under trial in the preceding year. In the past season's trials it was observed as being particularly vigorous right throughout the growing-time. Arran Chief this year shows a much bigger range than last year. In this variety nearly half the lines were so badly mixed with Northern Star that no account could be taken of their cropping-power.

Correlation between Virus Disease and Cropping-power.

It has been asked many times by farmers if there is any relationship between incidence of virus disease and the resultant cropping-power. This year the reports on the inspections of ninety-seven lines of Dakotas were examined, and the incidence of virus disease in the trial plots was compared with the yields of the plots. The figures in Table 2 show conclusively that as the percentage of virus-infected plants increases so the yield decreases.

Table 2.—Correlation between Virus Infection and Yield.

(The lines examined are grouped according to yield.)

Number of Lines in each Group.	Limits of Yield in each Group in Tons per Acre of Cropping-power.	Average Percentage of Virus Infection for the Lines of each Group.
1	11·5 – 11·9	7
Nil	11·0 – 11·4	..
4	10·5 – 10·9	16
2	10·0 – 10·4	16
6	9·5 – 9·9	18
5	9·0 – 9·4	17
6	8·5 – 8·9	18
5	8·0 – 8·4	19
4	7·5 – 7·9	20
7	7·0 – 7·4	22
9	6·5 – 6·9	23
11	6·0 – 6·4	33
6	5·5 – 5·9	37
11	5·0 – 5·4	43
6	4·5 – 4·9	43
4	4·0 – 4·4	45
3	3·5 – 3·9	62
1	3·0 – 3·4	61
4	2·5 – 2·9	68
1	2·0 – 2·4	76
1	1·5 – 1·9	94

Grading of Certified Seed.

Owing to the number of complaints coming to hand regarding uneven grading of certified seed an attempt was made during the 1928–29 season to control this to some extent. The method adopted for the 1929-30 season's grading embodied slight alterations. Full particulars will be found in an article published in the last April issue of the *Journal*, or may be obtained from any Instructor in Agriculture.

Reasons for Rejection.

It has been very difficult to obtain figures which illustrate satisfactorily the relative importance of the various "reasons for rejection of lines." For example, a crop with 10 per cent. of rogues and 50 per cent. of leaf-roll is rejected on account of rogues, and the leaf-roll is not taken into consideration; also, such crop is not subjected to inspection for eelworm, powdery scab, &c.

Table 3.—Reasons for Rejection of Lines.

Variety.	1 Number of Lines entered.	2 Percentage rejected for Rogues.	3 Number inspected for Virus and Cropping-power.	4 Percentage rejected for Virus and Deficient Cropping-power.	5 Number inspected for Eelworm, Powdery Scab, &c.	6 Percentage rejected for Eelworm, Powdery Scab, &c.	7 Number issued with Provisional Certificates.	8 Percentage of Total issued with Provisional Certificates.
		Per Cent.		Per Cent.		Per Cent.		Per Cent.
Dakota	97	20·6	77	55·8	34	20·6	27	27·8
Aucklander Short-top ..	61	26·2	45	37·8	28	7·2	26	42·7
Arran Chief	54	61·2	21	76·3	5	40·0	3	5·5
King Edward	19	10·5	17	41·2	10	10·0	9	47·5
Aucklander Tall-top ..	18	16·7	15	33·3	10	20·0	8	44·5
Up-to-date	16	12·5	14	78·7	3	33·3	2	12·5
Bresee's Prolific	14	14·3	12	41·7	7	..	7	50·0
Epicure	13	..	13	53·8	7	..	6	46·2
Majestic	9	..	9	77·8	2	..	2	22·2
Northern Star (South Island)	4	..	4	75·0	1	..	1	25·0
Total of all varieties ..	363	23·5	279	54·2	128	14·8	109	30·0

In Table 3 an attempt has been made to overcome this difficulty, with regard to the more important varieties, and the following explanations amplifying the brief headings are here added:—

Column 1 represents the number of crops inspected for rogues.

Column 2 gives the percentage rejected on account of rogues.

Column 3 represents the number of crops which passed the "rogue" inspection and were subjected to an inspection for virus disease and test for cropping-power.

Column 4 gives the percentage of those inspected which were rejected on account of virus disease and deficient cropping-power.

Column 5 represents the number of crops which passed in the virus inspection and cropping-power test.

Column 6 gives the percentage of those inspected for powdery scab eelworm, &c., which were rejected for these diseases.

Column 7 represents the number of crops which passed all these inspections and have been provisionally certified.

Column 8 gives the percentage of crops passed compared with the original number inspected as in column 1.

FIG. 3. TWO LINES OF DAKOTA POTATO UNDER CERTIFICATION TRIAL.
On left, a healthy line; on right, line heavily infected with leaf-roll.

11·6 tons per acre. 3 tons per acre.

FIG. 4. YIELDS FROM THE TWO LINES OF DAKOTA SHOWN IN FIG. 3.
[*Photos by J. Claridge.*

Table 4 shows the number of lines inspected in the less common varieties and reasons for rejection of these. It is interesting to note the number of these which may be classed as "seedsmen's" lines and are often grown in private gardens, which have been rejected owing to their high virus percentage or low cropping-power.

Table 4.—Results of Inspection of Less Common Varieties.

Variety.	Number of Crops entered.	Number rejected on account of			Number provisionally certified.
		Rogues.	Virus and Deficient Cropping-power.	Eelworm, Powdery Scab, &c.	
Iron Duke	4	2	1	..	1
Jersey Bennes ..	4	..	2	2	..
Endurance	4	..	2	1	1
Early Regent ..	3	..	1	..	2
Great Scot ..	4	..	3	..	1
Brownell's Beauty ..	1	..	..	..	1
Robin Adair ..	1	..	..	..	1
Golden Wonder ..	2	..	1	..	1
Maori Chief.. ..	2	1	..	..	1
Field Marshal ..	1	..	..	..	1
Early Rose	1	..	..	1	..
White Beauty of Hebron	1	1	..	..	..
North Downs ..	1	..	..	..	1
Kerr's Pink.. ..	1	..	1	..	..
Sharpe's Express ..	1	..	1	..	..
Witchill	1	..	1	..	..
Eclipse	1	..	1	..	..
Arran Victory ..	1	..	1	..	..

Areas provisionally certified.

Provisional certificates are issued on the results of the field inspections and sample trial reports, with a view to giving the grower some definite information as to his line, and this certificate is in effect a statement that, provided his graded seed is up to the standard indicated in the field inspections, he will be issued with the necessary tags and full certificate.

A list of all provisionally certified crops was published in the *Journal* for May last, and lists of final certificates in the July issue and present number. Intending purchasers of certified seed would be well advised to refer to these.

In Table 5 is given a list of crops passed provisionally, and the areas of these crops during the three seasons in which the certification system has been operating.

Of the 363 crops inspected this past season 104 were from seed provisionally certified last year and the remainder from seed either not under trial or rejected last year. One hundred and eight crops gained provisional certificates this year, and of these sixty-two had been similarly certified last year. That is to say, 60 per cent. of crops provisionally certified last year and entered again this year have been again provisionally certified, while only 18 per cent. of those crops not provisionally certified last year have been given provisional certificates this year.

Table 5.—Number of Crops of each Variety provisionally certified, Seasons 1927–28, 1928–29, and 1929–30.

Variety.	Number of Crops.			Area (in Acres).		
	1927–28.	1928–29.	1929–30.	1927–28.	1928–29.	1929–30.
Dakota	11	12	27	121	81	132
Aucklander Short-top ..	7	11	26	75	67	96
Aucklander Tall-top ..	5	4	8	30	17	56
King Edward	..	1	9	..	2	25
Bresee's Prolific ..	10	4	7	106	54	78
Arran Chief	4	9	3	36	54	6
Up-to-date	3	5	2	13	20	3
Epicure	5	6	5	13	15	29
Endurance	1	3	1	1	4	3
Early Regent ..	1	2	2	35	23	4
Majestic	..	2	2	..	6	11
Iron Duke	..	..	1	..	..	12
Great Scot	..	2	1	..	2	4
Golden Wonder ..	..	2	1	..	4	1
Field Marshal	..	1	1	..	7	5
Robin Adair	2	..	1	6	..	3
Brownell's Beauty ..	..	1	1	..	1	3
Northern Star ..	1	1	8	35	12	17
Maori Chief	..	..	1	..	..	2
North Downs ..	..	..	1	..	..	2
Totals	50	66	108	471	369	491
Average areas ..	..	..	..	9·4	5·5	4·6

The inspection work in connection with potato-certification, and upon which this review is based, has been carried out by the Instructors in the districts concerned—mainly Messrs. C. C. Leitch (Christchurch), J. O. Wallace (Dunedin), and J. E. Bell (Auckland), and the assistance of these officers in supplying data for this article is here acknowledged.

EXPERIMENTS IN FRUIT-SETTING OF DELICIOUS APPLE.

DURING the past two years experiments have been carried out in Otago by the Horticulture Division with the object of determining the treatment which would cause strong-growing Delicious trees on rich alluvial soil to set their fruit satisfactorily. Several series of tests—manurial and pruning—were carried out. Reporting on the work, Mr. W. K. Dallas states that the treatment which gave the best results was a normal pruning, combined with the application of sulphate of potash at the rate of 2 lb. per tree in the month of August in each of the two years. The trees set a crop which averaged fourteen loose petrol-cases per tree, as compared with an average of five loose cases in the other plots. The pruning consisted of a judicious cutting-out of leaders where it was considered there were too many in the trees, with the object of allowing more sunlight into the centre. The lateral growth was thinned out, and the remaining laterals shortened back from 14 in. to 18 in. in length.

MINERAL CONTENT OF PASTURES RESEARCH.

SOME NOTES ON THE WORK IN 1929-30.

(Concluded.)

B. C. Aston, Chief Chemist, Department of Agriculture.

Malnutrition on certain Poverty Bay Back-country Pastures on Coarse Pumice Soils.

Additional samples were obtained from this area during the past year in midsummer, when the pasture presumably would be at the lowest content of phosphoric acid. The samples gave evidence that they were comparatively free from contaminating soil, and afforded evidence of the low iron content comparable with what is found in the "bush-sick" pumice lands. With the pure uncontaminated samples there appeared to be evidence of correlation between the iron content of the pastures and the degree of healthiness of the stock grazed. Pastures showing the relatively higher iron content produce healthy sheep, and those showing the lower iron content produce sheep showing evidence of deficiency disease. A large-scale manuring trial with phosphates is now in progress, and should the sheep go sick on this land there will be no doubt of the trouble being the same as "bush sickness."

It will be noted from the accompanying analyses (Tables 1 and 2) that the only samples of pure red clover analysed exhibited the same low iron content comparable with that of the bush-sick lands. It should be noted also that previous samples of pasture collected in October (see *Journal* for July, 1929, p. 26) showed no deficiency of phosphoric acid, and therefore one is justified in assuming that the low phosphoric-acid content at the end of January has a seasonal cause.

All the samples here dealt with were collected on 23rd and 24th January, 1930, and consisted of seven ordinary pastures (Nos. 6708–14), one red clover (No. 2064), and one white clover (No. 74).

Table 1.—Summary of Poverty Bay Back-country Pasture Analyses.

Results expressed as percentages on matter dried at 105° C.

Pasture Samples.	Ash.	Soluble Ash.	Silica (SiO_2).	Iron (Fe).	Alumina (Al_2O_3).	Phosphoric Acid (P_2O_5).	Calcic Oxide (CaO).
Average of seven samples	10·93	6·36	4·57	0·0088	0·02	0·60	0·65
Highest ..	12·63	9·24	5·92	0·0130	0·03	0·96	0·85
Lowest ..	10·05	4·34	3·15	0·0067	0·02	0·42	0·51

Pasture Samples.	Magnesia (MgO).	Manganese (Mn).	Chlorine (Cl).	Soda (Na_2O).	Potash (K_2O).	Nitrogen (N).
Average of seven samples	0·37	0·0156	0·94	0·11	3·26	2·98
Highest	0·51	0·0290	1·39	0·17	5·17	3·92
Lowest	0·27	0·0094	0·67	0·04	2·08	2·18

[*Analysts: Misses Young, Strand, and Mason.*

The samples were remarkably free from earthy contamination, as shown by the low alumina content. The iron figures may therefore be taken as showing the iron that is actually present in the plant tissues.

Table 2.—Results of Individual Poverty Bay Samples.

Expressed as percentages on matter dried at 105° C.

Lab. No.	Locality.	Remarks.	Iron (Fe).	Manganese (Mn).	Phosphoric (P_2O_5).	Calcic Oxide (CaO).
6708	Rakauroa	Lambs go sick in this unmanured paddock	0·0070	0·011	0·43	0·55
6709	,,	More healthy than No. 6708	0·0130	0·009	0·44	0·69
6710	Matawai	Unmanured. Lambs die here	0·0081	0·013	0·42	0·51
6711	,,	Same as No. 6710, but manured with phosphates	0·0085	0·013	0·96	0·69
6712	,,	Healthy; new burn; unmanured	0·0100	0·017	0·76	0·60
6713	,,	Moderately sick ..	0·0086	0·017	0·74	0·85
6714	,,	One of the most sick paddocks in the district. Unimproved	0·0067	0·029	0·47	0·69
2064	,,	Red clover on sick country, phosphated	0·0065	0·0069	0·64	3·33
74	Rakauroa	White clover on sick country, phosphated	0·0120	0·0052	0·78	1·61

An important point to notice is that clovers (supplying calcium) are present in fair quantity in the country, although lime is not shown in high quantity by analysis. This is just one of those cases where it is difficult to include in the samples an adequate amount of white or red clover, although the sheep probably secure a fair proportion.

Wairarapa District.

The collection of samples of pasture from this phosphate-deficient district has been continued, and the results of the analyses are supplying interesting information on seasonal and other data. The district is a very large one, in which, while it contains the most phosphate-deficient pastures yet met with in New Zealand, giving rise to "Waihi disease" in cattle, certain areas afford soils of great fertility and pasture of high nutrient value. Clovers are in no area generally deficient, and the calcium content is as a rule good, and in cases even high. Insufficient uncontaminated samples have been received to determine the natural iron content, but in cases there is evidence of excess of manganese which is often found with iron deficiency.

Waihi disease is due to deficiency of phosphorus in the diet of the cattle. This trouble presents the simplest deficiency disease which occurs in New Zealand, the evidence being convincing and continuous from the soil, the pasture, and the animal. The chain of reasoning one seeks to establish in all other deficiency cases is in this complete and satisfactory. Briefly, (1) the soil is found to be deficient in available and total phosphoric acid by chemical analysis; (2) treatment of

the soil with phosphates banishes the disease in cattle thereon depastured, provided the climatic conditions allow the ready absorption of the phosphates by the pasture; (3) the untreated pasture on chemical analysis gives a very low result for the phosphorus content; (4) on top-dressing with phosphates the phosphorus content of the grazed pasture (not necessarily the hay) immediately rises if the rainfall is sufficient; (5) the animal shows a train of definite symptoms suggesting lack of phosphorus in the diet, swollen joints and lameness in the cattle affected being prominent; (6) treating the animal with (*a*) phosphate lick, (*b*) superphosphate in the drinking-water or drenching with syrup of phosphate of iron, or (*c*) grazing on top-dressed pasture cures the disease.

Previous chemical analyses of soils and pastures will be found in this *Journal* for October, 1928, p. 242, and August, 1929, p. 79. The results of analysis of pasture-samples collected in the four seasons of the past year are now available for seven different farms representing six different areas in the Wairarapa. Most of the samples are badly contaminated by earthy matter, as shown by the high alumina content. The iron and manganese are probably much too high from this cause. Cow pastures in North Wairarapa are represented by those of Mauriceville and Hamua farms, those in South Wairarapa by Featherston and Dalefield farms. Sheep pastures are represented by two Masterton farms and a Martinborough farm. In all of these the phosphoric-acid content increases to the maximum in the spring, falling with the summer, and reaching the lowest figure in the autumn. The calcium is lowest in the winter and tends to increase with the progress of the seasons, giving the maximum figures in the autumn. Nitrogen in every case attains its maximum content in the spring, falling to the lowest in the autumn.

Table 3.—Average Results of Analyses of Wairarapa Pastures in 1929–30.

Expressed as percentages on the matter dried at 105° C.

Location and Class of Pasture.	Season.	Phosphoric Acid (P_2O_5).	Calcic Oxide (CaO).	Chlorine (Cl).	Nitrogen (N).
North Wairarapa cow pastures (Mauriceville, Hamua)	Winter (1929) ..	0·78	1·16	0·94	2·93
	Spring (1929) ..	0·93	1·68	1·05	4·43
	Summer (1929–30)	0·74	1·65	1·24	3·49
	Autumn (1930)	0·60	1·87	1·11	3·08
South Wairarapa cow pastures (Featherston, Dalefield)	Winter (1929) ..	0·94	0·74	1·15	3·70
	Spring (1929) ..	0·96	0·99	1·38	4·10
	Summer (1929–30)	0·82	1·00	1·24	4·00
	Autumn (1930)	0·71	1·08	1·18	3·25
Mid-Wairarapa sheep pastures (Masterton), medium to good	Winter (1929) ..	0·67	0·57	0·93	2·45
	Spring (1929) ..	1·09	0·75	1·33	4·95
	Summer (1929–30)	0·77	0·69	1·14	3·27
	Autumn (1930)	0·62	0·85	1·00	2·47
South Wairarapa sheep pastures (Martinborough), poor to medium	Winter (1929) ..	0·66	0·55	0·99	3·23
	Spring (1929) ..	0·64	0·69	0·87	2·69
	Summer (1929–30)	0·60	0·56	0·99	2·76
	Autumn (1930)	0·49	0·79	0·90	2·10

[*Analyst: P. H. Sykes.*

NOTE.—One sample was analysed from each locality every season, and the mean of results given for each group. At Featherston two samples were collected from one farm. All samples were analysed in duplicate.

In addition to those shown in Table 3, a number of farms in various localities yielded samples for three seasons of the year, no summer samples having been collected. In all of those in which figures for winter, spring, and autumn samples are available the autumn samples show the lowest phosphoric-acid content, while the calcium usually rises in the autumn. Farms which previously showed an unusually low phosphoric-acid content in the pasture have again exhibited the same deficiency, thus confirming the first finding published, that some Wairarapa pastures contain the least phosphoric acid of any met with in New Zealand. Following are the results from the Atea (Hukanui) and Kaituna, together with those from two Martinborough farms, which also show decidedly low figures in phosphoric acid and calcium :—

	Atea.			*Kaituna.*	
	Phosphoric Acid (P_2O_5). Per Cent.	Lime (CaO). Per Cent.		Phosphoric Acid (P_2O_5). Per Cent.	Lime (CaO). Per Cent.
Winter ..	.. 0·29	0·45	Winter	.. 0·24	0·44
Summer	.. 0·30	0·63	Summer	.. 0·41	0·63
Autumn	.. 0·29	0·71	Autumn	.. 0·35	0·86

	Martinborough.				
	FARM A.			FARM B	
	Phosphoric Acid (P_2O_5). Per Cent.	Lime (CaO). Per Cent.		Phosphoric Acid (P_2O_5). Per Cent.	Lime (CaO). Per Cent.
Summer	.. 0·62	0·42	Spring	.. 0·44	0·40
Autumn	.. 0·18	0·37	Summer	.. 0·39	0·40

An interesting fact elicited in connection with the analysis of the Wairarapa pastures is that the percentage of carbon dioxide (carbonic-acid gas) found in the pasture ash calculated on the dry matter is roughly proportional to the clover percentage. It may therefore prove of considerable assistance in assessing the influence of the clover in the composition of the pasture, and even render a botanical analysis unnecessary.

Although leaching is one of the most prominent faults in a coarse air-borne pumice soil, it is noteworthy that Waihi disease never develops on such soils.

Middle Waikato District.

Sixteen samples from typical dairy-farms were collected in the spring of 1929 by Mr. R. E. R. Grimmett in association with the local veterinary officer of the Department. The samples were analysed fully and form an interesting accession to our knowledge of the composition of spring pastures which have been liberally phosphated. The samples were nearly all highly contaminated with soil, and thus the iron and possibly the iodine content determination may be faulty in representing more than the amount of mineral matter present in the tissue of the pasture ; therefore the figures for iron and alumina are not given in Table 4. It will be seen that the Waikato pastures are richer than the Taranaki pastures in nitrogen.

Table 4.—Analyses of Waikato Spring Pastures. (September, 1929.)

Results expressed as percentages on matter dried at 105° C.

Samples.	Ash.	Crude Silica.	Soluble Ash.	Phosphoric Acid (P_2O_5).	Lime (CaO).
Average of sixteen ..	10·16	2·20	7·97	0·86	0·91
Highest	11·06	2·77	9·15	0·99	1·15
Lowest	9·13	1·47	7·12	0·76	0·57

Table 4—continued.

Samples.	Magnesia (MgO).	Manganese (Mn).	Chlorine (Cl).	Sodic Oxide (Na_2O).	Potassic Oxide (K_2O).	Nitrogen (N).
Average of sixteen	0·39	0·020	1·08	0·33	3·66	4·55
Highest ..	0·46	0·035	1·46	0·61	4·51	5·21
Lowest ..	0·29	0·007	0·92	0·23	2·67	3·92

The average of six determinations for iodine was 41·8 gammas (maximum 65·1, minimum 27·6).

Temporary Sterility.

It was agreed (see Annual Report of Scientific and Industrial Research Department for 1929, p. 21) that certain work should be done in connection with the analysis of pastures in districts where temporary sterility in dairy cattle was a serious menace to the dairy industry. This investigation has been carried out during the past year in the Taranaki and Waikato districts. A large number of samples have been collected by Mr. Grimmett in close co-operation with the veterinary officers of the Department of Agriculture. No decided correlation between mineral content and incidence of temporary sterility has been detected, but the work is being carried on and will provide useful data regarding the average composition of the typical dairying pastures. The cost of this investigation was borne entirely by the Department of Agriculture. Altogether fifty-two samples were collected, and the analyses, performed in duplicate, for calcium, phosphoric acid, and nitrogen have been completed in every case. In addition nine samples were analysed fully.

In the Taranaki samples collected in the spring of 1929 the results for phosphoric acid may be possibly rather lower than usual, due to the abnormally droughty period, when only one-half the usual rainfall was recorded. Whether this is a correct deduction will be ascertained from the analysis of samples collected in the coming spring of 1930.

Table 5 in the next section shows the mean results obtained from forty-eight samples averaged (omitting extraordinarily low samples due to low fertility or abnormally poor pasture). The rainfall figures showing the abnormal season are given in Table 6.

Taranaki Dairy-pastures Investigation.

This is the first work of its kind and scope done in New Zealand. The samples were obtained by an expert sampler from portions of pasture actually bitten by the stock, and the samples may thus be taken to represent what the cows are actually eating. The whole district of Taranaki, which is of all others in New Zealand, predominantly dairying-country, was carefully traversed by the sampler in company with the Veterinarian in charge of the district. Tables 5 and 7 show how far the work has gone at present and the results obtained in one season—the spring (September) of 1929. The pastures generally were well supplied with clovers, and rye-grass was a prominent constituent of most of them. Further samples were obtained in the autumn (March, 1930), and the results are presented in Table 8.

Table 5.—Analyses of Taranaki Dairy-pasture Samples collected in Spring of 1929.
Results (except botanical analyses) expressed as percentages on matter dried at 105° C.

Samples.	Phosphoric Acid.	Lime.	Nitrogen.	Botanical Analyses.		
				Grasses.	Legumes.	Weeds.
Group 1: West of Mount Egmont (Oakura, Oaonui, Okato, Tumahu, Opunake, Omata).						
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Average of thirteen	0·85	1·10	4·12	69	24	7
Maximum ..	1·01	1·35	4·93	90	39	13
Minimum ..	0·66	0·71	3·39	54	7	3
Group 2: East of Mount Egmont (Stratford, Inglewood, Toko, Egmont Village, Midhirst, Tariki).						
Average of fifteen	0·92	1·28	4·26	72	21	7
Maximum ..	1·18	1·62	4·92	92	46	11
Minimum ..	0·73	0·88	3·82	44	5	3
Group 3: North of Mount Egmont (New Plymouth, Lepperton, Brixton, Huirangi, Waitara, Bell Block, Westown, Fitzroy).						
Average of thirteen	0·86	1·11	4·09	70	24	6
Maximum ..	1·08	1·29	5·35	87	41	9
Minimum ..	0·71	0·85	3·62	53	7	2
Excluded from average (three samples)—						
New Plymouth	0·53	1·09	3·42	..	..	..
Bell Block ..	0·50	0·83	2·87	..	..	..
„ ..	0·62	0·92	3·54	..	..	..
Group 4: North of Waitara (Uruti, Urenui, Waitoitoi, Pukearuhe) (papa country, littoral ironsand, volcanic loam).						
Average of seven	0·89	0·85	4·34	79	17	4
Maximum ..	1·03	1·05	5·11	85	23	6
Minimum ..	0·75	0·69	3·68	72	12	2

NOTE.—Groups 1, 2, and 3 are soils from basic volcanic rocks from Mount Egmont.

Table 6.—Rainfall Record for Spring of 1929 compared with previous Readings.

Period.	New Plymouth.	Lepperton.	Tariki Hydro.	Inglewood.	Riversdale, Inglewood.	Stratford.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Total for August, September, and October, 1929	9·98	12·29	16·42	15·40	16·20	14·89
Average for August, September, and October, 1926, 1927, 1928	19·96	27·12	30·76	31·76	33·65	32·03

In addition to the foregoing partial analyses ten samples of pasture had been collected from all parts of the district in April, 1929, including Bell Block, Westown, Oakura, Oaonui, Okato, New Plymouth, Lepperton, Tikorangi, and Uruti. These samples were analysed more fully and gave results as presented in Table 7.

Table 7.—Analyses of Taranaki Pasture Samples collected in April, 1929.

Results expressed as percentages on the matter dried at 105° C.

——	Ash.	Silica (SiO_2).	Soluble Ash.	Phosphoric Acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).
Mean ..	9·29	2·27	7·02	0·63	1·27	0·60
Highest ..	10·59	2·87	8·87	0·83	1·80	0·69
Lowest ..	7·83	1·72	5·84	0·47	0·94	0·50

——	Manganese (Mn).	Chlorine (Cl).	Sodic Oxide (Na_2O).	Potassic Oxide (K_2O).	Nitrogen (N).
Mean ..	0·015	1·27	0·65	2·12	3·68
Highest ..	0·038	1·60	1·06	3·06	4·23
Lowest ..	0·009	0·95	0·45	1·26	2·72

Table 8.—Analyses of Taranaki Dairy-pasture Samples collected in Autumn of 1930

Results (except botanical analyses) are expressed as percentages on the matter dried at 105° C.

Samples.	Phosphoric Acid.	Lime.	Nitrogen.	Botanical Analyses.		
				Grasses.	Legumes.	Weeds.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Group 1 : West of Mount Egmont.						
Average of eleven..	0·62	1·10	3·08	76	16	8
Maximum ..	0·80	1·46	3·98	95	35	14
Minimum ..	0·46	0·62	2·29	55	3	2
(Three samples less from Oaonui, two of which were previously included in average.)						
Group 2 : East of Mount Egmont.						
Average of fifteen..	0·71	1·29	3·30	70	19	11
Maximum ..	0·92	1·66	3·92	94	38	21
Minimum ..	0·54	0·90	2·77	51	2	1
Group 3 : North of Mount Egmont.						
Average of twelve	0·61	1·36	3·04	73	17	10
Maximum ..	0·77	1·92	3·58	84	34	21
Minimum ..	0·44	0·95	2·23	52	10	3
(No sample from Tikorangi.)						
Excluded from average (three samples)—						
New Plymouth..	0·51	1·28	2·94	57	21	22
Bell Block ..	0·47	1·25	2·52	75	8	17
,, ..	0·41	1·33	2·24	75	11	14
Group 4 : North of Waitara.						
Average of seven ..	0·75	1·06	3·29	80	13	7
Maximum ..	1·11	1·59	4·20	95	27	13
Minimum ..	0·48	0·66	2·35	69	2	2

[*Analysts : A. Sim, and Misses Strand and Mason.*

Table 8 shows the results of analysis of samples collected in the autumn of 1930 (March). The samples were taken from the same farms and same paddocks as the spring samples, except that certain farms were omitted in the autumn. These latter are noted after the respective group in the table.

Iodine Deficiency.

An interesting case of iodine-deficient land has been discovered in a low-lying area near Pembroke, Lake Wanaka, Otago. The soil and pasture proved on analysis to be low in iodine. Lambs were born with enlarged thyroids, and the history of the area is that stock, although grazed on top-dressed pasture, make every effort to break bounds in order to escape, it is thought, from the iodine-deficient pasture to other areas which are not deficient.

Feeding iodine as potassium iodide, recommended by this Department, apparently causes a cessation of the desire to escape from the paddocks. The matter is discussed in an article published in this *Journal* for April, 1930, where the veterinary, chemical, and agricultural aspects are dealt with by Messrs. Hopkirk, Dayus, and Grimmett, and by Miss Simpson, who carried out the iodine determinations.

Considerable interest is being displayed by the farming community on the subject of iodine feeding to domestic stock, and there is danger that too much may be expected of a substance which must be fed in very small doses, and which may prove an unnecessary burden on the farmer. Probably the best advice that can be given to farmers on average healthy pasture is to try an experiment on a small number of animals before embarking on a general iodine treatment.

How this can best be done will depend on the class of animal and the facilities offering. The treatment of poultry presents no special difficulty, the dosing of the drinking-water being a simple and efficient method of distributing the iodine ration. In a herd of milking-cows, keeping certain cows to certain bails until each has had a lick daily would be a fairly simple method. For sheep and store cattle the regulation of the supply to certain selected animals is more difficult, but should not prove insuperable.

The method of trial and error is better than any amount of theorizing and is the only method one can be sure about in *average* cases. Analysis of soils and pastures can be most misleading with regard to iodine when viewed in the light of the limited knowledge about iodine content. In *exceptional* cases where there is evidence of symptoms suggesting iodine deficiency—such as enlarged thyroid glands (goitres in the neck), hairlessness in young animals, or the birth of monsters—there will be little doubt in the mind of the local officer as to advising a general treatment with iodine of the whole flock or herd.

Central Otago Pastures.

Analyses of a number of pasture samples collected in the spring (October) of 1929, in connection with lamb mortality known as "pulpy kidney" have been made and compiled. These analyses do not lend themselves to any form of condensed statement. There appears to be a wide range of variation in the results. That mineral nutrients in the

pasture should be low in this arid and frosty district, especially in early spring, is perhaps to be expected, in spite of the soil being well supplied with plant-food. No general deficiency of any necessary element which would contribute towards the mortality can be definitely alleged, and caution is necessary when comparing this pasture with that found in humid climates. In the arid area the green pasture will be much drier, and the sheep will presumably consume a greater portion of dry matter. In fact, they will be consuming something akin to hay as regards the water content, and hence a greater proportion of dry and mineral matter per day than the same sheep would consume in the humid areas.

The ash, crude silica, soluble ash, iron, alumina, phosphoric acid, lime, magnesia, manganese, chlorine, iodine, soda, potash, and nitrogen were determined in thirty-two samples of Otago and Southland pastures. In a number the sulphur was determined, and this proved to be lower than normal. A deficiency of sodium and chlorine was also found in some samples. This work is to be continued, and at the writer's suggestion experimental licks containing sulphur will be used in the areas badly affected with "pulpy kidney."

Summary.

The practical results of the year's work in connection with the Empire Marketing Board's grant for research into deficiencies in New Zealand pastures may be summarized as follows:—

Mairoa "Dopiness" in Sheep.—The intensive investigation in connection with the lime status of the soils of Mairoa and adjacent districts has proved conclusively that the *fine* volcanic soils are suffering from a widespread and severe calcium deficiency bad enough to stigmatize as "calcium starvation." Experiments with sheep support the theory that calcium compounds must form the greater part of any system of top-dressing designed to overcome the disease.

Bush Sickness, the name by which the progressive anæmia in ruminants occurring on *coarse* volcanic soils is known, is completely cured by iron treatment of the animal. This cure, however, was nullified by the cattle eating ragwort, which is rapidly spreading throughout affected districts. It has been proved at Mamaku that the ragwort menace may be successfully fought by chemical means and by short-time stocking with sheep, which are not affected by the ragwort to the same extent as cattle, this (sheep-grazing) being a very old remedy. Citrate, which used to be imported by the hundredweight, has now to be brought in by the ton to combat bush sickness, and is sold at cost price (2s. 6d. per pound) to the farmers. It may be roughly stated that 1 lb. will keep one cattle beast healthy for one year.

A series of soil experiments has now been in operation for two years with a view to test the effect of green-manuring, always held to be a method of soil-improvement which would convert bush-sick into healthy country. This is fundamental work on soil-improvement and is being undertaken without any reference to economic possibilities. Successful crops of blue lupin have been turned under on the very worst and red clover on the best of bush-sick soils. The results will not be available for a considerable time, seeing that it takes normally six to nine months for a cattle beast to show signs of the bush sickness. The extension of the bush-sick area to the pumice country at the back

of Poverty Bay may be expected. In fact, wherever large areas of coarse pumice soils are encountered without adjacent finer types suitable for change paddocks it may be expected that bush sickness will occur.

Taranaki and Waikato dairy pastures have been systematically examined to ascertain whether correlation could be established between pasture composition and temporary sterility. The samples analysed from all types of soil will prove of considerable assistance in fixing standards for typical North Island dairy pastures.

Wairarapa pastures are providing most interesting information regarding the seasonal effect on the mineral content. Well-marked phosphate deficiency is shown in some of the poorer pastures, with evidence of disease in stock, mineral supplements feeding and top-dressing experiments have been instituted

Iodine deficiency has been definitely proved to be affecting stock in two widely separated areas in the South Island—the flat areas near Lake Wanaka, and in the Ahaura Valley, Grey County. Other areas, in the North Island, are at present under suspicion.

Cawthron Institute Results.—The foregoing are the chief lines of work undertaken by the Department of Agriculture. In addition, work at the Cawthron Institute bearing on deficiency diseases is being continued. In the Moutere Hills area, Nelson, the most important results achieved have been the cure, on lime-phosphate deficient soil and pasture, of ruminants evidently suffering from deficiency disease, by bone-meal and other licks. Cattle, particularly cows in milk and young stock, eat the bone-meal greedily, and great improvement in the health of the stock has resulted. In the case of sheep considerable quantities of bone-meal have been eaten by ewes in the winter and early spring, but more difficulty has been experienced in estimating the value of the lick. The chief deficiencies reported are calcium and phosphorus, but there also appears to be an unknown factor in the Moutere Hills' pasture which causes xanthin calculi to form in the kidneys—a symptom not hitherto observed in any other deficient locality in New Zealand. Seasonal differences account for great changes in the composition of the Nelson pastures, but the peak of quality, as with Wairarapa pastures, occurs in the spring growth, and the lowest quality is reached with the autumn and winter growth.

In concluding these notes it should be stated that the samples of pasture were collected in the field by the method of Godden, which is that specified to be used in connection with the Empire Marketing Board's work. For the sheep pastures it has been customary to select only bitten portions of the green and growing pasture. There have been cases, however, in very dry seasons where the pasture is not growing, having obviously been killed quickly while green by the drought. As this was the sole food for the sheep, it had to be taken as a normal pasture in one instance.

Much credit is due to the staff at the Department's Chemical Laboratory, Wellington, for their efforts during the year in coping with the increased number of samples received, especially Messrs. F. T. Leighton and R. E. R. Grimmett, Analysts, P. H. Sykes, and F. B. Thompson, also to Misses Simpson, Strand, Young, and Mason for well-sustained work.

BLACK DISCOLORATION IN ANNATTO-COLOURED CHEESE.

INVESTIGATION AT WALLACEVILLE LABORATORY.

G. F. V. MORGAN, N.D.A., N.D.D., Dairy Bacteriologist, Department of Agriculture.

A NUMBER of samples have been forwarded to the Wallaceville Laboratory for investigation into the cause of two types of discoloration which were prevalent in certain lines of cheese made during the past season.

One type is that of a dark-grey or muddy nature, sometimes found in close-textured portions of coloured cheese. Again, the same type of discoloured portion appearing in the neighbourhood of open slits in which luxuriant growths of moulds are frequently found, and which have been observed to spread along the sides of cracks that have developed after the cheese has been cut to expose further discoloured portions. Lastly, a discoloration in the nature of a partial bleaching of the curd.

This last type of discoloration will not be dealt with fully in the present report, as further investigation into the causes and conditions required for the bleaching are still being carried out. It may, however, be mentioned that in some cases the bleaching and dark discoloration have occurred together, with evidence that would seem to point to the fact that the bleaching preceded the final darkening. The bleaching nearly always occurs in the neighbourhood of cracks in the body of the cheese. The matter here presented is by way of a progress report, and has yet to be fully demonstrated in experimental cheese manufacture which is under way.

The first specimens of cheese to be examined showed the presence of a muddy discoloration in the neighbourhood of cracks, and also in isolated close portions of the curd, which, however, in a number of cases showed signs of probable crack development. A number of samples of the latter discoloured portions were taken for microscopic examination. These were first of all dissolved by ether, washed, and treated with ammonia, centrifuged, and the precipitated casein examined. This method of treatment gave very clear slides for examination, free from fat and coarse debris. Two types of microscopic field were seen: (1) Showing predominance of yeasts and the presence of considerable numbers of fairly long, thin, non-sporulating rods; (2) a similar field showing a predominance of the rod, with a considerable number of yeasts present. This latter type of field was by far the commonest. The results of this microscopic examination were fully borne out by the plating method on Sabaraud's agar for yeasts and ordinary nutrient agar for bacteria—in fact, both media gave similar results.

Further samples were at this time received showing a muddy discoloration in the neighbourhood of large cracks spreading through the body of the cheese. This discoloration as it spread into the cheese changed to a definite bleaching, and terminated sometimes as far as 2 in. from the crack itself. The surface nearest the crack showed a very deep, almost

black, discoloration to the depth of about $\frac{1}{8}$ in. This was mainly due to the pigment produced in the mycelium of the mould. Below this the muddy-grey discoloration commenced and spread well below the depth of the mycelial growth, terminating as a bleaching 2 in. and sometimes slightly more from the original crack.

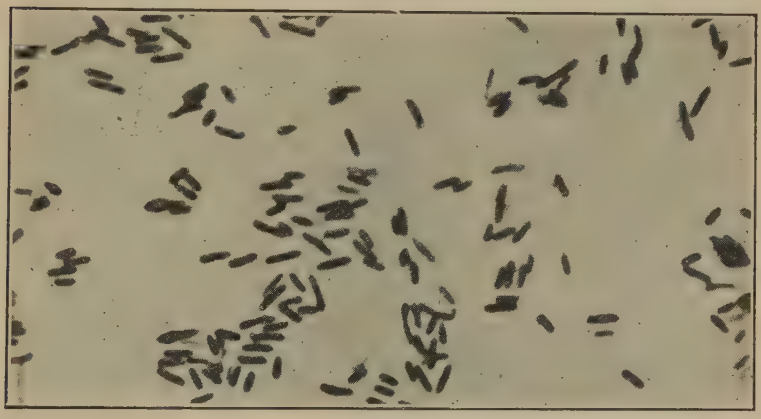


FIG. 1. MICROPHOTO OF PROTEUS VULGARE (TYPE) ISOLATED FROM DARK DISCOLOURED PORTIONS OF ANNATTO-COLOURED CHEESE.

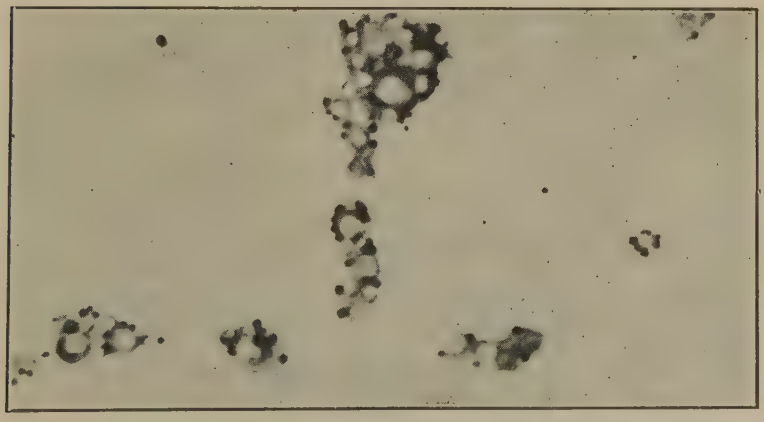


FIG. 2. MICROPHOTO OF YEAST ISOLATED FROM DARK PATCHES, BUT PREDOMINANT IN BLEACHED AREAS.

These cheese-samples were cut under specially sterile conditions giving cut surfaces that showed the discoloured layers to the best advantage; samples were taken from the top (dark discoloured portion)

and from the bottom (bleached area). These samples were examined both microscopically and by the plating method with selected media. The following results were obtained :—

Samples from Top or Dark Discoloured Layer.

Cultures.	Microscopic Examination.
Moulds present in considerable number (*Penicillia*)	Fragments of mould mycelium.
Large yeast colonies, about fifteen per plate	Yeasts.
Small to pin-point colonies of yeasts rods, the rods predominating	Rods predominant.

Samples from Bleached Portions.

Cultures.	Microscopic Examination.
Moulds absent	Moulds absent.
Yeasts forming small colonies apparently in pure culture	Yeast predominant; rods occasional.

At this stage of the investigation pure cultures were isolated of the predominant organism, including the rod, the yeast, and the mould. These organisms appeared in the discoloured portions in pure culture as far as the microscopic and the plate-culture methods can determine.

Classification of Pure Cultures.

Mould—One of the *Pencillium* group.

Rod—Probably *Proteus vulgare*. Characteristics: Gram negative, actively motile, pleomorphic, weak acidity in lactose media; thin, grey, translucent, and spreading on agar; gelatine liquefied; lead acetate turned brown by the production of sulphuretted hydrogen.

Yeast—Classification not determined; spore formation rapid, with the production of false mycelial growth.

The predominance of a rod of the *Proteus* type in the discoloured portions of annatto-coloured cheese, together with its capability of sulphuretted hydrogen production drew attention to the possibility of lead being present in the cheese. (A similar trouble has already been investigated in Britain by Professor Leitch, of Kilmarnock, who found lead to be present in cheeses showing this dark discoloration, and traced the cause to annatto which had been stored in red-leaded drums. The examination for the presence of lead was carried out in this case by a micro-analytical method.)

A micro-analytical method published by L. T. Fairhall, in the *Journal of Biological Chemistry*, 1923, for the determination of lead was adopted at Wallaceville. This is known as Behren's and Kley's triple nitrite test. Samples of the discoloured portions of the cheese under examination, samples of annatto by which the cheese was coloured, and samples of normal-coloured cheese as a control, were ashed. The ash was then treated with distilled water and the solution made just acid to methyl orange by the addition of hydrochloric acid. A drop of 2 per cent. copper acetate was added and the copper precipitated as a sulphide by the addition of sulphuretted hydrogen. (The precipitation of the copper sulphide brings down with it the colloidal lead sulphide.) The precipitate was then separated by centrifuging, washed repeatedly, and finally dissolved in dilute nitric acid and 4 per cent. sodium-acetate solution. A drop of the resulting liquid was then evaporated on a microscope slide, chilled, and a triple nitrite procured by the addition of 10 per cent. acetic acid and a small crystal of potassium nitrate. At this stage the triple nitrite appeared in the liquid on the slide in the form of small square black or dark-red crystals.

FIG. 3. PLATE CULTURE FROM DARK AREAS.

Large colonies—yeasts (type present only in small numbers); pin-point and small colonies—yeasts and rods.

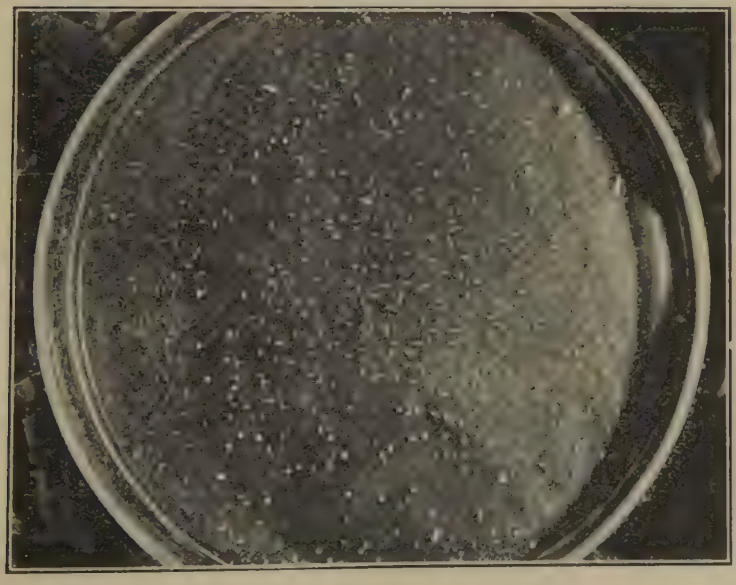


FIG. 4. SHAKE CULTURE FROM BLEACHED PORTION OF CHEESE: YEASTS IN ALMOST PURE CULTURE.

The test gave the following results with the samples of cheese already mentioned. The discoloured portion showed the presence of the black lead crystals at the rate of one or two per microscopic field. The ash from the annatto showed a considerable number of these black crystals per field. The control sample of normal-coloured cheese gave a blank under the microscope.

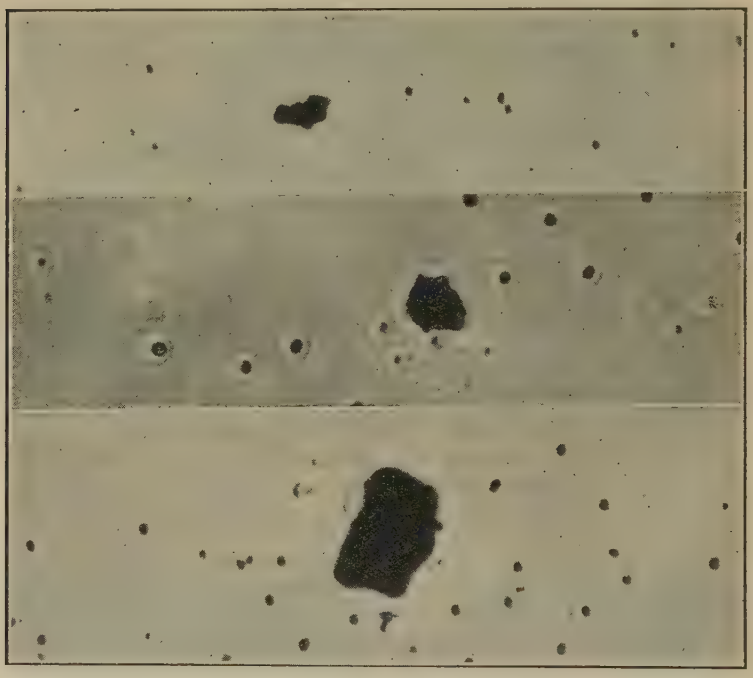


FIG. 5. BLACK TRIPLE NITRITE CRYSTALS SEEN UNDER THE MICROSCOPE IN MASSES.

At bottom, large mass against the side of which may be seen the square outlines of individual crystals.

It may here be added that after the lead had been found present in the ash of the annatto in such quantities by the microscopic test an ordinary qualitative test was applied to the residue of untreated ash and gave a positive result. The test was checked as far as possible at every stage, and a blank control was also carried out to check the purity of the reagents used.

The finding of lead in the cheese and lead in excess in the ash of the annatto, together with the isolation of organisms of the *Proteus* group, seem to give fairly conclusive evidence of the cause of the dark discoloration. Further experiments, however, were tried to demonstrate the effect of the organisms found present in the discoloured portions of cheese in conjunction with lead added to annattoed milk agar.

For the purpose of this experiment, 250 c.c. of milk were sterilized in a 300 c.c. flask and 0·05 per cent. of a solution of lead acetate added. At the same time 2 grammes of powdered agar were dissolved by boiling in 15 c.c. water, forming a viscous solution, capable, however, of being poured. When the milk was sterile and the agar in solution annatto was added to the milk it approximated the colour of annatto-coloured cheese. The agar was then quickly added, thoroughly shaken, and distributed in the body of the still hot milk. The whole was kept shaken till the plates were ready for pouring. This method gave even, homogenous plates similar to an annattoed curd, and is the outcome of a number of trials of various means of obtaining satisfactory milk plates. The only disadvantage of this method is that the plates are rather soft compared with ordinary agar, but they are quite suitable for use even when streak cultures are required.

Cultures were then made from the organisms found present in the discoloured cheese. One culture was made from a poured dilution of the *Proteus* and yeast, the second from a mixed culture of yeast and mould spores. Blank control plates were also incubated at the same time.

The plate containing the mixed culture of yeast and *Proteus* was incubated at 37° C. (98½° F.). This, in the first instance, brought along the *Proteus*, and at the end of forty-eight hours' incubation the plate was removed and examined. Examination showed that no surface or isolated colonies were visible, but a dark, muddy discoloration had spread unevenly through the body of the plate. From this discoloured portion the *Proteus* organism was seen in considerable numbers when smears were examined microscopically. This plate was then incubated for another three days at 20° C. and re-examined. This time the smears from the discoloured portion showed a marked increase in yeasts, with a lightening of the discoloration, and in one place where yeast cells were markedly predominant a definite bleaching had occurred not only on the surface, but through the body of the medium. This culture showed quite definitely the possible action of certain members of the *Proteus* group in the presence of lead in dairy products.

The second culture, containing the yeast and the *Penicillium* mould, was incubated for five days at 20° C. The mould, though a luxuriant growth was obtained and the medium proved ideal for its growth, showed no signs of causing any discoloration, but in isolated portions of the plate, where the mould had not established itself and the yeast had been able to develop, a surface bleaching occurred.

No claim is made in this report that the yeast isolated is the cause of bleaching. The possibilities of the *Proteus* group, however, in conjunction with the presence of lead, are obvious.

It is interesting to find that in some cheeses the bleaching and the dark discoloration appear together, and that a considerable number of yeasts are found present in the dark portions, apart from their predominance in the bleached areas. It seems possible that in some cases the bleaching commences first, to be followed by the action of the *Proteus* type, together with the presence of lead, the yeasts gradually decreasing in number as the darkening occurs.

The predominance of yeasts in discoloured cheese of this particular line has also been reported from Reading.

PRECOOLING OF APPLES FOR EXPORT SHIPMENT.

R. SUTHERLAND, Cool Storage Officer, Horticulture Division.

THE process of cooling fruit in a ship's hold is somewhat slow, and this applies particularly to the older type of vessel not designed for the carriage of fruit. In consequence the product is apt to arrive at its destination in an overripe or wasty condition, resulting in heavy economic loss to the grower and consumer, as well as varying financial loss to all parties interested in the distribution. The last few years have seen a marked development in the practice of precooling a portion of our cargoes of perishable fruits before long-distance shipment to the marketing centres. Precooling is a pronounced step towards efficiency, one of the principal arguments in its favour being that fruit can be quickly reduced in temperature to a point where ripening and disease development is retarded — temperature, humidity, and products of respiration playing an important part in the life-history of fruit.

New Zealand is essentially a primary producing country, exporting its fruit, meat, and dairy-produce to Britain and other parts of the world. But although fruit is a living organism which respires rapidly at high temperatures, it is the only one of these products which up to the present is not all cooled to its transport temperature before shipment. Refrigeration has long been used as an agent in the preservation of our foodstuffs, and plays a most important part in the development of the fruit industry. In addition to retarding the ripening process it is equally important in checking any tendency toward decay. Practically every case of decay known to the industry develops from some minute organism, either bacterial or fungal. Most of these organisms thrive at ordinary temperatures, while they become dormant at temperatures round about freezing-point.

Investigations extending over a lengthy period tend to demonstrate that the sooner fruit is cooled after picking the longer it can be preserved in cool storage. The interval between picking and the ultimate cooling of the fruit in the ship's hold under existing conditions may sometimes extend to several weeks, which greatly reduces its storage life, resulting in rapid deterioration, owing to the high temperatures to which the fruit has been exposed in its early stages. The value of precooling before shipment has not been fully realized, although it is admitted that cooling a large body of closely stowed fruit on shipboard is a big task; weeks may elapse before favourable conditions are obtained, owing to the difficulty of conveying the refrigeration uniformly throughout the cargo. The alternative is to precool the fruit before shipment, and thereby place it on the vessel in ideal condition.

Although scientists and practical investigators into this important matter agree that precooling is highly advantageous, it is not intended to suggest that by an extension of the present precooling facilities all our transport problems would disappear, as there would still be room for considerable improvement in the methods of ventilating the holds and distributing the refrigeration throughout the fruit cargo.

The rate of loading a ship's hold is somewhat faster than in a land store, where usually only a few hundred cases of fruit are stowed daily.

These stores are generally equipped with a refrigerating plant and a system of air circulation capable of reducing the temperature rapidly; also, the engineer is able to gain access to the chambers for the purpose of observing the temperatures and regulating the distribution of the refrigeration to the various sections of the chambers accordingly. On the other hand, the ship's holds are filled in a few days, thousands of cases of fruit being loaded daily, and immediately the hatches are put on the ship's refrigeration has not only to cool down the great bulk of closely stowed cases, but has also to remove the heat developed by the fruit, which after picking continues to respire, the rate of respiration being proportional to the temperature of the fruit itself. All fruits, in common with other living things, consume oxygen and produce carbon dioxide. This process of respiration does not cease at cool-storage temperatures, but is merely slowed down. The rate of respiration is dependent on several other factors, such as the kind of fruit and degree of maturity.

Any delay between gathering and cool storing greatly reduces the storage life of the fruit, resulting in early deterioration. At high temperatures ripening goes on rapidly, and delay before storage exposes the fruit for a longer time to a high temperature. Thus the end of its life comes much sooner than it otherwise would. The product will also show a larger proportion of physiological and fungal decay than it would if it were placed in cool storage immediately after picking.

If fruit is not precooled before shipment, then the heat must be extracted on board ship. This can only be achieved by temperature difference, and, as additional heat is being produced continuously by the fruit, the temperature of the latter for the greater part of the voyage must remain above that of the atmosphere of the hold in which it is stowed. If an attempt is made to force a reduction in the temperature too quickly there is a danger of the fruit nearest the cold brine grids or the incoming cold air being frozen.

In order to minimize the difficulties of reducing the temperature and producing suitable conditions for fruit transport in the shortest time on shipboard, precooling must be resorted to. This can be accomplished in cool-storage rooms on land equipped with an efficient refrigerating plant and air-circulating system for distributing the refrigeration throughout the storage chambers. As space in land storage is not so valuable as it is on board ship the cases of fruit can be stowed in such a manner (in a number of small compartments) that relatively low and uniform temperatures can be maintained, reducing the apples to 33°–35° F. within four to five days; whereas, owing to the larger quantities of fruit stowed in the ship's hold daily, a similar reduction in the temperature may take three to four weeks. Then, again, the reduction in the temperature will not be uniform throughout the cargo of apples. This factor of uneven cooling emphasizes the necessity of precooling the fruit before shipment, so that all the apples will be properly protected at the start of the voyage overseas.

The fruit must be transported to the ship as quickly as possible after removal from the precooling stores, and every precaution taken to maintain uniformly low temperatures during loading. The holds should be well cooled down before loading commences at the port of shipment, in order to extract the heat from the insulation, and every

opportunity should be availed of when working of the cargo ceases temporarily to circulate the cold air and secure a reduction in temperature, even if it be only a few degrees. In the process of precooling the fruit is reduced in temperature to a point where respiration is slow, minimizing the danger of the accumulation of carbon dioxide.

The function of refrigeration is not only to reduce the temperature of the air, but, what is of equal importance, the relative humidity of the air is reduced. It is well known that a damp or saturated atmosphere is conducive to the growth of moulds and fungi, the spores of which are often on the fruit when it leaves the orchard.

In order to compete successfully with other fruit-exporting countries it is essential that general precooling be adopted, so that our fruit may be exported under the best possible conditions.

TESTING OF PUREBRED DAIRY COWS.

INTRODUCTION OF ADDITIONAL 305-DAY TEST AND NEW BUTTERFAT STANDARDS.

W. M. SINGLETON, Director of the Dairy Division, Wellington.

The 305-day Test.

A MOVEMENT in the direction of inaugurating a 305-day class for Certificate-of-record cows has been in existence in New Zealand for a number of years, having originated as far back as April, 1921. The matter was gone into very fully at the time, and the then Minister of Agriculture approved of the introduction of this alternative test, provided reasonably representative support was offered by our breeders of purebred dairy cattle. When the breeders were approached, however, it was discovered that very few entries for such a class were likely, and that the trend of opinion appeared to be very distinctly in favour of the full-year test as originally introduced.

The subject was revived last year, when at a meeting of the New Zealand Jersey Cattle Breeders' Association, held in June, a resolution was passed to the effect that the Department of Agriculture be requested to inaugurate an additional C.O.R. test for Jersey cows and of 305 days' duration. The various other purebred dairy-cattle associations co-operating in the C.O.R. test were approached, and it was apparent that the 305-day class was at last to find more general favour. Our New Zealand breeders were no doubt influenced by the trend in the United States, where, particularly with the Jersey breed, there is a distinct tendency for the 305-day class to take the position previously held by the full-year test. The Dairy Division is not in possession of statistics relating to all breeds in the United States, but, so far as the Jerseys are concerned, we are advised that 1,168 records were completed in the 365-day class for 1928–29 as against 1,566 records in the 305-day class. Some 22·9 per cent. of the Advanced Register Jersey entries in 1922–23 were for the 305-day test, while in 1928–29 the percentage had reached 57·38, with a consistent upward trend throughout the intervening years.

There is much to be said for and against the 305-day class as compared with the full-year period. From the wider point of view it may be said that the C.O.R. test as introduced here by the Dairy Division in 1912 was brought into being for the purpose of providing registered purebred sires and dams—particularly registered purebred sires—with butterfat pedigree backing, to act as a foundation and a breeding basis for the Dominion's ordinary grade and crossbred dairy herds. To reiterate a frequent statement, the average dairy cow in New Zealand milks for a comparatively short lactation period, the average being somewhere around the eight months' mark. It is contended that this period could profitably be increased, which would in turn raise our average, and therefore our total butterfat production for the same number of cows. The accepted principles of heredity have been sufficiently tested to make it a reasonable assumption that the average lactation period for New Zealand should gradually increase by crossing registered purebred bulls, from cows which have been proved to have produced profitably for a full year, with our ordinary grade and crossbred factory-supply herds.

The position from the dairy-farmer's point of view is that the 305-day test conforms more to the average dairying practice, and that the full-year test with its fifteen months' period between calving throws the cows out of season, and therefore upsets the systematic operation of the dairy herd. This may be so, and there are no doubt a number of small farmer-breeders who are affected, particularly those whose herds include one or two registered purebred individuals. It may also be contended, however, that the breeding of purebred dairy cows is more a matter for the specialist—that is to say, the man who devotes his whole energies to the breeding and development of purebred dairy cattle.

Needless to say, the 365-day class will continue as in the past, and will no doubt receive support from the majority of our specialized breeders of purebred dairy cattle, and it is hoped that the 305-day class will swell our C.O.R. entries by way of opening up an avenue of activity for those farmer-breeders previously mentioned who find C.O.R. yearly test inconvenient for their purpose.

The Dairy Division is now accepting entries for the 305-day division of the C.O.R. test. Rules governing the new class are in the course of preparation, and each testing breeder will receive a copy as soon as possible after the rules have been finalized. In the meantime it is desired to make breeders conversant with the more important proposals, so that they may be aware of the qualifications necessary for certificates. The existing general C.O.R. rules for the yearly test will apply equally to the shorter testing-period. Following are points on which information may be desired :—

(1) Application.—Application for testing in the 305-day division is to be made on the same form and in the same way as for the full-year C.O.R. test, provided that the applicant must indicate whether the entry is for the yearly or the 305-day division. In the case of cows entered in the 305-day division, it will be incumbent upon the owner, should he afterwards desire the testing continued beyond the 305-days, to advise the testing officer of this fact not later than the ninth monthly test.

(2) Fees.—Fees for the 305-day test will be the same as for the yearly test—namely, 8 guineas for the first cow each season and 3 guineas

for each subsequent entry; provided that in the event of a cow qualifying for certificate under both divisions within the one testing period, the owner will be entitled, on payment of a certification fee of 10s. 6d., to receive both a 305-day and a yearly certificate.

"(3) *Calving Requirements.*—No four-year-old or mature cow is eligible for entry for the 305-day division unless she has dropped a living or mature calf within 395 days (thirteen months) prior to the calving for commencement of test; and every cow in order to qualify for a 305-day certificate must drop a mature calf within 395 days (thirteen months) after the calving for commencement of test. For second-class 305-day certificates an extra thirty days will be allowed, making a total of 425 days between calving for test and calving subsequent to test.

(4) 305-day Butterfat Standards.—The following minimum butterfat standards may be accepted in the meantime as applying for the 305-day division. These, it will be noticed, are 25 lb. less than the new standards for the full-year division as provisionally notified at the conclusion of this article.

2 years and under ..	250·5 lb.	Increasing by $\frac{1}{10}$ lb. butterfat for each day from two years to five years of age.
3 years and under ..	287·0 lb.	
4 years and under ..	323·5 lb.	
5 years and over ..	360·0 lb.	

The titles decided upon for future use are "C.O.R. (Yearly) Test," and "C.O.R. (305-day) Test." Breeders and others can assist us to avoid confusion by endeavouring to make sure that these descriptions are strictly adhered to in connection with any advertising or other reference to Certificate-of-record testing.

With the introduction of the 305-day test for purebred dairy cows New Zealand dairy-herd owners may be considered to be extremely well catered for. Persons informed regarding the testing of dairy cows will know that this makes the fifth system to come into operation in New Zealand. There is the Association system for the breeder in outlying and scattered districts. This was the Division's original scheme, introduced in 1909, and it has rendered considerable service. Following on the Association system the C.O.R. test was inaugurated. This was in 1912, and catered for registered purebred dairy cows. In 1922 the Group system for the testing of ordinary herd cows came into existence, and it has grown so rapidly that to-day it is the most heavily supported system in New Zealand, and each year shows a rapid increase in favour. One stage further is the Official Herd-test, which came into operation in 1927, and gives opportunity for the testing of purebred dairy cows on a herd basis. This system has not been availed of to the extent that was anticipated, although the support has been promising. To complete the chain there is now the 305-day test, which in some respects may be regarded as a sort of half-way mark between the Official Herd-test and the Certificate-of-record yearly test.

The influence of the new class on the future of the purebred dairy cow is difficult to forecast. If it is instrumental in fostering a wider support of the C.O.R. testing system, then the new class will have rendered no small service, and this fact alone may be considered sufficient to warrant its introduction. The only doubtful point, however, may be its influence in the direction of shortening the existing average lactation period of our tested purebred dairy cows.

Butterfat Standards for the Full-year Test.

The question of the introduction of the 305-day class has given rise to discussion concerning the existing C.O.R. standards for the 365-day period. Some breeders have been in favour of the elimination of the standard, although the majority appear to prefer to see the existing standard raised. Here, again, there is something to be said on both sides. The raising of the standard would have the tendency to show the production of our average certificated purebred cow in a better light, and would also demand more careful selection and better handling of entries. On the other hand, a standard naturally implies a barrier or border line, and there will always be odd cows whose production places them just on the wrong side of the barrier. Our records show a number of instances of cows which have qualified by a bare pound of butterfat and other cows which have failed to qualify by a narrow margin. This naturally means that the one cow enjoys the credit and advertisement connected with a Certificate-of-record, while the other does not; moreover, her record of production may also be omitted from pedigrees and general advertising. In actual practice one cow may be as good as the other. As a general rule standards are automatically set by the average production of the various classes.

There is also the fact that if every tested cow were certificated irrespective of her yield and provided she qualified in other respects—that is to say, on calving, &c.—then full particulars of every tested cow would be available to students or prospective buyers, and consequently many pedigrees could be more complete from the viewpoint of butterfat-production figures.

Breeders are hereby advised that it is proposed to increase the minimum butterfat requirements for the 365-day C.O.R. test. Although the amounts have not yet been finally fixed, it may be provisionally accepted that the following standards will apply in future:—

2 years and under ..	275·5 lb.	Increasing by $\frac{1}{10}$ lb. butterfat for each day from two years to five years of age.
3 years and under ..	312·0 lb.	
4 years and under ..	348·5 lb.	
5 years and over ..	385·0 lb.	

In the event of any change being made in the above-quoted standards the subject will be recurred to in the *Journal*.

"Donin" Butter-starter Culture.—This culture is a preparation made in Switzerland for producing the most desirable flavour in butter, and some time ago samples of the preparation were received from Mr. W. Wright, London. Experiments were carried out at several factories in the Auckland and Wellington Provinces by using similar cream treated and not treated with the culture. In no case did the butter from the treated cream score higher at the time of grading, nor was the flavour so good as that of the non-treated, after the usual two months' cold storage.—*Dairy Division.*

"Wheat-manuring Experiments in the South Island."—Table 35 of this article, printed at the bottom of page 50 in last month's *Journal*, was inadvertently misplaced. It should be read as at the top of that page, immediately before its related comments beginning "Comparisons between super 2 cwt. and super 1 cwt."

IDENTIFICATION OF COWS FOR CERTIFICATE-OF-RECORD AND OFFICIAL HERD-TEST.

THE EAR TATTOO SYSTEM ADOPTED.

Dairy Division.

EVER since the commencement of the Certificate-of-record Test for purebred dairy cows the need for a system of identification, particularly with the Jersey breed, has had consideration by the Dairy Division. The matter is one of the oldest of herd-testing problems, and it is doubtful if it has yet been satisfactorily solved. By identification is meant the marking of cows in such a way as to make them individually, permanently, and conveniently distinguishable, even to persons who have never before seen them. Moreover, to be entirely perfect an identification system should not permit of undetectable manipulation. Therein lies the principal difficulty.

It is not intended to suggest that substitution takes place ; in fact, in the whole of the Division's testing experience we have had no case where there was the slightest cause for suspicion of such a procedure. There are, however, some fairly large herds under official test, and as a rule testing officers do not see the cows more than once a month, so that it is difficult to remember the various individuals, particularly with the Jersey breed, where there are no broken colour markings to note, and few distinguishing features. Testing officers take descriptive notes of cows under test, but these are not always sufficient in the case of change of testing officer. This, however, is the narrower aspect of the case. The broader view is to be found in considering the advantages of satisfactory identification during the time animals are on test, and a convenient and safe means of permanently linking up the animal with its butterfat record.

The Dairy Division has tried several identification methods, but with little success. The first experiment was with a chain round the base of the horns, and a strong padlock to which there was no duplicate key, the lock being numbered and also carrying the Government's mark of the broad-arrow. This method had proved very successful among the owners of purebred dairy stock in the Island of Jersey. In New Zealand, however, where many of the herds are allowed to run free on more or less broken country, the cows were apt to get the chains torn off on fences and logs, and consequently this method was abandoned. In any case the chain method still left unsolved the problem of the ever-increasing polled or dehorned cow.

Next was tried a leather collar with a padlock, but, apart from being unsightly, this method met with the same fate as that of the chain round the base of the horns.

A third experiment was made with aluminium ear-tags. While these are now in fairly wide use, and appear to be giving satisfaction to many users, we found that several of the C.O.R. cows on which they were tried ripped them out, and in doing so considerably disfigured he ear. Consequently the ear-tag method was discontinued.

Four things go to the making of a perfect identification system. It must be convenient to apply and easy to decipher; it must permit of a distinct mark for each animal and withstand interference. There is also a fifth which is of increasing importance—the cow must not be disfigured from the viewpoint of entry in the show ring. For one or other of these reasons firebranding on the horns, hoofs, or skin, or the use of clumsy appendages is not desirable.

The Ear Tattoo System.

A system which is growing in favour, and has now been in operation sufficiently long to prove itself, is the tattoo-mark in the ear. This appears to possess most of the desirable attributes, while from the aspect of safety, the more calves marked at birth the fewer unmarked cows will the future hold, and consequently the possibility of irregular practice will grow less as time goes on.

For the information of any breeder or owner of purebred dairy cattle of any of the breeds participating in the C.O.R. test (except Friesians, which are referred to later), and who may contemplate making entries for Certificate-of-record or Official Herd-test, we desire to make it known that no cow or heifer born on or after the 1st July, 1930 (that is to say, having her first calf as a two-year-old in 1932) will be eligible for acceptance for either of the tests mentioned unless such animal is suitably identifiable by tattoo-mark in the ear. This means that the cow or heifer must be individually identifiable by a distinct tattooed mark or number or code, and that an owner's herd brand or herd mark alone will not be considered sufficient identification for the purpose of entry for Certificate-of-record or Official Herd-test.

Breeders are advised to communicate with the secretary of their breeders' association regarding the tattooing of their calves. The secretary will doubtless have full details as to tattoo outfits and the application of the tattoo, and the association will probably wish to have some uniformity as to the system adopted by its members. Moreover, the system of marking for identification purposes should be in conformity with the system of marking registered by the respective breeders' associations. We also wish to make it clear that the course outlined is necessary only where there is not already sufficient identification by tattoo. Neither is any further action necessary in the case of animals already marked in connection with the Dominion Group Herd Testing Federation's calf-marking scheme.

Photographs for Friesians.—On account of the distinctive markings of Friesian cattle it is intended to rely upon photographs for this breed. A rule providing for photographs for identification is already embodied in the C.O.R. rules, and it is intended to enforce this rule in future.

Conclusion.

It is considered that the introduction of an identification system for Certificate-of-record and Official Herd-test cows represents the fulfilment of a long-standing need and is an improvement in the service. It is recognized that breeders who are not already tattooing will be involved in a little expense and trouble, but the result should be to the ultimate advantage of all dairymen, and particularly to the breeders and owners of our purebred dairy cattle.

THE OFFICIAL SEED-TESTING STATION.

RECORD OF OPERATIONS FOR YEAR 1929.

N. R. Foy, Seed Analyst, Plant Research Station, Palmerston North.

During the calendar year 1929 a total of 9,153 samples were received for testing at the Department of Agriculture's Seed-testing Station, this being a decrease of 996 on the number received the previous year. However, with the increase in the number of requests for purity analyses, the number of tests made during the year amounted to 12,244, or only 3 per cent. less than in 1928.

Tables Nos. 1, 2, 3, 4, and 5 give information concerning the distribution of the samples received, origin, classification, &c. The 879 samples shown for the Plant Research Station in Table 1 consisted as follows:—

Seed-testing Station, 387—Experimental, storage, and special tests.

Mycology Section, 289—Tests on control and treated samples in connection with experimental control of seed-borne diseases.

Agrostology Section, 179—Tests on samples used in pasture-plant investigation.

Crop Experimentalist, 25—Seed used in plot experiments.

Table 1.—Origin of Samples received, 1929 and 1928.

Senders, &c.	Number of Samples.	
	1929.	1928.
Seed-merchants	7,827	8,509
Farmers and seed-growers	138	206
Government Departments other than Agriculture	67	365
Department of Agriculture—		
Fields Division	99	54
Plant Research Station	879	890
Retests	143	115
Totals	9,153	10,149

Table 2.—Number of Samples received each Month, 1929 and 1928.

Month.	Number.		Month.	Number.	
	1929.	1928.		1929.	1928.
January	483	666	July	1,007	881
February	754	871	August	833	925
March	835	1,086	September	891	727
April	1,118	872	October	728	995
May	1,008	950	November	579	870
June	638	984	December	279	322

Table 3.—Classification and Numbers of Samples and Tests, 1929 and 1928.

Classification.	Number.	
	1929.	1928.
Samples for germination only ..	5,953	7,555
Samples for germination and purity ..	3,101	2,505
Samples for purity only	89	89
Purity tests made	3,190	2,594
Germination tests made	9,054	10,060
Totals	12,244	12,654

Table 4.—Number of Samples from the different Land Districts and Centres therein, 1929 and 1928.

Land District, &c.	1929.	1928.	Land District, &c.	1929.	1928.
Southland (total) ..	**2,258**	**2,950**	Canterbury (total) ..	**947**	**1,189**
Gore	1,235	1,417	Christchurch ..	555	667
Invercargill ..	977	1,465	Other	392	522
Other	46	168	Otago (total) ..	**814**	**732**
Wellington (total) ..	**1,950**	**2,221**	Dunedin	725	698
City	1,061	1,055	Other	89	34
Palmerston North and Feilding	629	799	Taranaki	**438**	**328**
Other	260	387	Hawke's Bay ..	**307**	**238**
Auckland (total) ..	**1,093**	**1,191**	Marlborough ..	**104**	**174**
City	1,013	974	Gisborne	**17**	**23**
Other	80	217	North Auckland ..	**1**	..
			Nelson	..	**13**
			Westland	..	..
			Overseas	**40**	..

Table 5.—Number of Samples of various Species reported on during 1929 and 1928, and Number of Tests made thereon, 1929 (excluding Laboratory Tests).

Species.	1929.			1928.
	Germination Tests.	Purity Tests.	Samples.	Samples.
Perennial rye-grass (*Lolium perenne*) ..	1,594	219	1,600	2,292
Italian rye-grass (*Lolium multiflorum*) ..	287	51	287	406
Western Wolths rye-grass (*Lolium westwoldicum*)	146	21	146	186
Cocksfoot (*Dactylis glomerata*)	430	147	438	433
Crested dogstail (*Cynosurus cristatus*) ..	747	538	770	954
Chewings fescue (*Festuca rubra* var. *fallax*) ..	697	571	722	678
Brown-top (*Agrostis tenuis*)	627	627	627	357
Danthonia pilosa	61	6	62	69
Danthonia semi-annularis	..	2	2	3
Timothy (*Phleum pratense*)	89	34	89	123
Fog (*Holcus lanatus*)	38	37	42	31
Meadow-fescue (*Festuca pratensis*)	31	11	31	26
Meadow-foxtail (*Alopecurus pratensis*) ..	51	27	52	37

Table 5—continued.

Species.	1929.			1928.
	Germination Tests.	Purity Tests.	Samples.	Samples.
Paspalum (*Paspalum dilatatum*)	124	8	124	71
Poa pratensis	38	18	38	52
Poa trivialis	12	5	12	12
Prairie-grass (*Bromus unioloides*)	22	2	22	20
Fiorin (*Agrostis stoloniferu*)	4	1	4	7
Red-top (*Agrostis palustris*)	8	6	8	7
Yarrow (*Achillea millefolium*)	33	22	33	48
Other grasses, &c.	15	1	15	15
Total grasses	5,054	2,352	5,124	5,827
White clover (*Trifolium repens*)	326	203	334	413
Red clover (*T. pratense*)	293	110	296	300
Alsike (*T. hybridum*)	63	30	63	73
Alsike and white clover	26	19	26	16
Subterranean clover (*T. subterraneum*)	35	4	35	35
Strawberry clover (*T. fragiferum*)	10	2	10	4
Crimson clover (*T. incarnatum*)	33	4	33	44
Suckling clover (*T. dubium*)	35	25	37	34
Lucerne (*Medicago sativa*)	87	20	89	105
Trefoil (*M. lupulina*)	27	7	27	30
Lotus major	76	52	77	82
Lotus hispidus	24	17	24	20
Other clovers, &c.	18	4	18	8
Total clovers, &c.	1,053	497	1,069	1,164
Swede (*Brassica campestris*)	253	10	253	334
Turnip (*B. rapa*)	355	12	355	412
Rape (*B. napus*)	109	8	110	91
Kale (*B. acephala*)	82	3	82	104
Mustard (*B. arvensis*)	20	1	20	24
Mangel (*Beta vulgaris*)	248	14	248	235
Carrot (*Daucus carota*)	118	2	118	101
Totals	1,185	50	1,186	1,301
Oats (*Avena sativa*)	24	..	24	28
Wheat (*Triticum vulgare*)	54	..	54	16
Barley (*Hordeum vulgare*)	27	..	27	15
Rye-corn (*Secale cereale*)	13	..	13	6
Tares and vetches (*Vicia* spp.)	3	..	3	4
Peas (*Pisum savitum*)	161	..	161	197
Japanese millet (*Echinochloa frumentacea*)	27	..	27	23
Other forages	63	40	64	10
Vegetables (other than peas)	398	..	398	386
Flower seeds	90	..	90	77
Forest-tree seeds	31	..	31	117
Seed mixtures	133	9	26	50
Totals	1,024	49	918	929

Table 6.—Showing Number of Samples tested for Purposes of the Canadian Seeds Act, and Grades into which the Seed would probably be placed when graded in Canada (1929).

Species.	Number of Samples.	Grade No. 1.	Grade No. 2.
Chewings fescue	12	12	..
Dogstail	1	1	..
Brown-top	2	2	..
Cow-grass	9	3	6
White clover	1	..	1
Totals	25	18	7

GRASS-SEEDS.

The average percentages of germination and seed impurities of the grass species are given in Table 7, and those of the main species produced in New Zealand in Table 8.

Rye-grasses.—A distinct improvement in the germination of perennial rye-grass is shown, with nearly one-third of the samples germinating 90 per cent., and over two-thirds 80 per cent. or better, compared with one-tenth and less than half respectively for the previous year. Although an improvement is shown for Hawke's Bay samples, the seed from this district has not regained the high average figure always associated with Hawke's Bay rye-grass three or four years ago. The same remarks apply almost equally to samples from Poverty Bay, of

Table 7.—Average Germination and Percentage of Extraneous Seeds in the Main Grass Species, 1929.

Species.	Germination Percentage.				Percentage of Samples germinating in the Groups—					Average Percentage of Impurities.	
	Average.		Maximum.	Minimum.	50–59.	60–69.	70–79.	80–89.	90–100.	Commercial Seeds.	Weed-seeds.
	1929.	1928.									
Perennial rye-grass ..	81	75	99	2	7	8	17	37	31	1·1	0·5
Italian rye-grass ..	79	78	98	8	6	10	29	34	21	0·1	0·4
Western Wolths ..	77	79	99	4	8	14	27	28	23	0·1	0·4
Cocksfoot	67	68	94	7	15	24	33	23	5	5·0	0·4
Crested dogstail ..	94	90	100	39	1	1	3	8	88	0·8	0·2
Chewings fescue ..	91	82	100	6	1	1	6	12	80	0·8	0·3
Brown-top ..	93	87	100	10	1	1	4	8	86	0·2	0·4
Timothy	85	81	100	5	8	9	5	9	69	0·3	0·1
Meadow-fescue ..	70	78	100	2	26	13	16	3	42	0·3	0·3
Poa pratensis ..	50	64	92	5	70	16	8	3	3	0·2	0·7
					0–29	30–39	40–49	50–59	60–100		
Danthonia spp. ..	29	49	85	9	34	23	16	10	17	0·8	0·3
Meadow-foxtail ..	21	31	60	1	74	12	6	2	6	1·3	1·8
Paspalum	33	47	80	2	45	17	6	19	13	0·3	0·7

which less than half germinated over 70 per cent. The average of 3·6 per cent. of seed impurity shown for Hawke's Bay rye-grass is made up of almost equal proportions of useful crop seeds and weed-seeds, the former consisting mainly of cocksfoot and the latter of goose-grass and hair-grass. This average can hardly be taken as a standard for Hawke's Bay seed, however, as a number of samples are included which were unusually high in impurity.

Awned Italian rye-grass occurred in the perennial rye-grass samples examined as follows: All samples, 72 per cent.; Southern 75 per cent.; Canterbury, 88 per cent.; Hawke's Bay, 51 per cent. In samples definitely labelled "perennial rye-grass" the maximum occurrence of awned seed of Italian was 13 per cent. Forty-five per cent. of the samples of perennial examined contained ergot, with a maximum content of 1·9 per cent. and an average of 0·1 per cent. Of the Italian rye-grass and Western Wolths samples, ergot occurred in 1 per cent. and 2 per cent. respectively.

Cocksfoot.—Little variation from the normal germination percentages is shown in cocksfoot for 1929. The percentage extraneous seeds over all samples is approximately 1 per cent. higher than in 1928, due to

Table 8.—Average Germination and Percentage Seed Impurities of the Main Grass-seeds grouped according to Origin, 1928 and 1929.

Place of Origin.	Average Percentage of Seed Impurities.	Percentage of Samples germinating in Groups—								Average Germination.		Number of Samples.	
		Below 70.		70–79.		80–89.		90–100.					
		1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.
Perennial Rye-grass.													
Dominion*	1·6	28	15	28	17	33	37	11	31	76	81	2,285	1,592
Southern ..	1·1	23	6	29	14	38	41	10	39	76	85	1,497	797
Canterbury	1·7	30	20	28	23	29	33	13	24	74	80	336	258
Sandon ..	0·7	20	18	26	16	23	28	21	38	76	82	117	127
Hawke's Bay	3·6	49	24	23	25	15	34	13	17	68	76	101	223
Poverty Bay	1·3	46	55	25	12	20	21	9	12	62	67	45	51
Cocksfoot.													
Dominion*	5·4	51	39	30	33	14	23	5	5	68	67	430	430
Danish ..	0·5	25	20	44	50	31	24	0	6	74	74	96	78
Akaroa ..	3·7	74	54	19	32	7	12	0	2	64	69	116	115
Plains ..	14·6	31	34	31	28	27	28	11	10	75	74	45	55
Crested Dogstail.													
Dominion*	1·0	3	1	2	3	10	8	85	88	90	94	941	747
Southern ..	1·0	1	1	2	3	9	7	88	89	94	94	789	656
Sandon ..	1·1	2	1	8	7	19	8	71	84	90	92	85	69
Chewings Fescue.													
Southern ..	1·1	10	2	7	6	16	12	67	80	82	91	661	697
Brown-top.													
Dominion*	0·6	7	1	4	5	6	8	15	56	68	93	355	627
Southern ..	0·5	4	1	5	3	14	8	77	88	91	94	204	494
Waipu ..	2·2	18	21	7	7	26	16	49	56	83	84	43	18
Canterbury	0·8	14	5	6	6	10	12	70	77	86	92	70	103

* Includes all samples.

the high rye-grass content of Plains seed, which gave an average percentage of 14·6, practically the whole of this being made up of rye-grass. Rye-grass occurred in all the samples of Akaroa seed examined, but the extremely high rye-grass content of some of the samples (up to 20 per cent.) would lead one to the opinion that the seed was grown on the Plains and was being sold as Akaroa.

Crested Dogstail.—Nearly 90 per cent. of the samples of dogstail received germinated 90 per cent. or over. Californian thistle occurred in 45 per cent. of the samples examined—from one to two hundred seeds per ounce, with an average of twelve per ounce.

Brown-top.—Table 9 gives average test figures on the samples of brown-top, all of which were tested under the International testing system. Southern seed, with an average pure germinating percentage of 90·1 per cent., shows particularly good quality.

Other Grasses.—The average germination percentages of grass-seeds not mentioned in Table 7 were as follows:—

Yorkshire fog	94	Indian doob	82
Poa trivialis	45	Ragstail	80
Prairie-grass	89	Tall fescue	82
Fiorin	92	Sheep's fescue	49
Red-top	94	Spartina Townsendii	20
Yarrow	64	Phalaris tuberosa (bulbosa)	72

Table 9.—Average Percentages of Pure Seed, Germination, and Pure Germinating Seed in Samples tested under the International Testing System, 1929.

Seed.	Purity.				Germination (of Pure Seed).	Pure Germinating Seed.
	Pure Seed.	Inert Matter.	Other Crop Seed.	Weed-seed.		
Brown-top—						
Dominion	96·3	2·8	0·2	0·4	93·1	89·2
Southern	96·9	2·3	0·1	0·4	93·6	90·1
Canterbury	95·8	3·5	0·2	0·6	91·8	87·4
Waipu	84·1	13·6	1·4	0·8	83·8	70·3
White clover—						
Certified seed	95·7	1·4	2·7	0·2	82·1	78·3

Clovers and Related Species.

The average percentage of germination and percentage of impurities for the main clovers, &c., is shown in Table 10. The general averages vary but little from those of previous years.

Suckling clover occurred in 88 per cent. of the white-clover samples examined, at the rate of 0·1 up to 60 per cent. Rib-grass, sorrel, catch-fly, and fathen were the most constantly occurring impurities in white clover. Dodder was noted in 3 per cent. of the samples and in small quantities only.

The average germination percentages of other clovers, &c., not included in Table 10, were as follows:—

		Hard Seeds.
Alsike and white (mixed)	78	10
Cluster clover	55	42
Bokhara clover	90	4
White and suckling (mixed)	78	18
Lotus corniculatus	49	26
Melilotus arvensis	21	41

Table 10.—Average Germination and Percentage Seed Impurities of the Main Clovers and Related Species, 1929.

Species.	Percentage of Germination.				Percentage of Samples germinating in Groups.				Seed Impurities.				Average Percentage of Hard Seeds.
	Average.		Maximum	Minimum.	0–69.	70–79.	80–89.	90–100.	Number of Species.		Average Percentage		
	1928.	1929.							Crop Seeds.	Weed-seeds.	Crop Seeds.	Weed-seeds.	
White clover ..	84	85	99	2	7	16	32	45	24	54	4·4	1·0	10·5
Red clover ..	86	85	100	8	12	5	7	76	24	56	0·5	0·5	4·6
Alsike ..	88	82	99	7	8	20	27	45	9	29	1·0	0·1	5·0
Subterranean clover	86	73	98	0	14	9	35	28	4	6	0·1	0·1	18·4
Strawberry clover	72	74	92	43	40	10	30	20	5	9	3·2	4·3	23·4
Crimson clover ..	55	66	99	3	39	3	3	55	4	10	0·4	0·2	0·0
Suckling clover	66	65	91	19	60	20	17	3	13	31	15·2	4·9	26·4
Lucerne	80	78	98	24	28	16	31	25	9	18	1·5	0·3	12·1
Trefoil ..	68	86	98	33	15	..	9	76	5	10	0·2	0·1	6·8
Lotus major ..	76	66	90	26	42	37	18	3	12	38	12·9	0·5	17·1
Lotus hispidus ..	53	55	76	30	88	12	..	..	16	21	20·8	0·7	30·5

Table 11.—Average Germination and Percentage of Seed Impurities of White and Red Clovers according to Origin, 1929.

—	Average.	Germination.					Seed Impurities.	
		Hard Seed.	Percentage of Samples germinating in Groups—					
			0–67	70–79	80–89	90–100	Crop Seeds.	Weed-seeds.
*White Clover.**								
New Zealand	86	11·1	5	17	38	40	4·5	1·0
New Zealand "Wild White"† ..	84	9·8	13	6	26	55	6·6	0·9
New Zealand certified seed ..	82	15·8	20	19	21	40	2·7	0·2
Imported	86	7·0	5	21	25	49	1·4	0·4
*Red Clover.**								
New Zealand	89	4·5	5	4	7	84	0·9	0·4
Imported	63	5·0	51	12	14	23	0·6	0·7

* See Table 10 for all samples. † As named by the senders of the samples.

Roots and Cruciferous Forages.

The average germination percentages for this group are shown in Table 13.

Inquiries have frequently been made concerning the germination percentages of the different varieties of root seeds—swedes, turnips, and mangels—it apparently being held by some that a low or a high germination capacity is a varietal characteristic, particularly in the case of certain varieties of mangels. Table 13 gives the percentages for the main varieties, and from these figures it will be noted that there are no great differences.

Table 12.—Average Germination Percentages of Roots and Cruciferous Forages, 1928 and 1929.

	Germination.				Percentage of Samples germinating in the Groups—									
	Average.		Max.	Min.	Below 59.		60–69.		70–79.		80–89.		90–100.	
	1928.	1929.	1929.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.
Swede ..	84	80	100	1	6	5	4	10	12	18	25	30	53	37
Turnip ..	88	86	100	1	4	4	2	6	6	8	19	24	68	58
Rape ..	92	89	99	2	1	..	2	3	3	7	18	27	76	63
Kale* ..	81	81	100	17	10	6	12	10	12	21	30	26	36	37
Mangel ..	76	68	98	8	9	26	16	27	32	33	34	12	9	2
Carrot ..	61	63	95	12	44	40	23	18	13	19	11	20	9	3

* Includes chou moellier.

Table 13.—Showing Average Germination of Main Varieties of Mangel, Swede, Turnip, and Kale, Years 1926 to 1929.

Variety.	1926.	1927.	1928.	1929.	1926 to 1929.	
					Number of Samples.	Average Germination.
Mangels.						
Prizewinner Yellow Globe ..	72	74	74	64	168	71
Long Red	80	77	76	66	134	75
Jersey Queen	82	71	77	70	95	74
Yellow Globe*	76	70	73	61	77	68
Giant Half Sugar	85	82	80	73	57	79
Golden Tankard	69	58	69	69	55	69
Red Intermediate	85	82	78	63	48	75
Orange Globe	80	76	70	66	32	72
New Smithfield Yellow Globe ..	85	85	82	66	25	81
Champion Yellow Globe ..	81	83	74	..	19	79
Giant Yellow Globe	..	70	81	71	16	74
New Lion Intermediate ..	91	73	81	64	11	78
Swedes.						
Superlative	84	78	82	81	218	82
Crimson King	82	75	83	79	127	80
Elephant	85	83	86	88	117	85
Champion	79	72	83	79	111	77
Magnum Bonum	81	80	80	79	79	80
Monarch	77	80	88	82	62	81
Masterpiece	77	89	88	84	41	84
Purple-top	87	87	83	92	37	87
Grandmaster	89	83	93	91	34	89
John Bull	81	81	89	86	32	85
Mervue	90	80	84	..	15	84
Empire	71	83	78	90	13	80
Vilmorin's	95	..	94	94	12	95
Bangholm	91	..	90	84	11	88
Buffalo	96	85	95	92	10	92

* Possibly Prizewinner or Champion Yellow Globe.

Table 13—continued.

Variety.	1926.	1927.	1928.	1929.	1926 to 1929. Number of Samples.	1926 to 1929. Average Germination.
Turnips.						
Imperial Green Globe	90	84	87	89	200	87
Purple-top Mammoth	85	90	88	85	193	86
Purple-top Yellow Aberdeen ..	83	81	88	84	163	84
Hardy Green Globe	90	85	90	92	152	89
Green-top Aberdeen	84	85	86	91	144	86
Devonshire Greystone	86	81	85	91	113	86
Lincoln Red Globe	89	82	90	90	106	87
Red Paragon	84	74	89	90	62	83
Romney Marsh	90	78	94	83	46	84
Fosterton Hybrid	86	81	..	..	42	84
Dale's Hybrid	..	..	92	82	27	87
Flockmaster	82	79	95	96	25	87
Waite's Eclipse	93	95	94	91	21	93
Purple-top Scotch	88	77	87	83	18	83
Renown	84	72	94	96	18	83
Invincible	85	82	93	84	17	86
Centenary	85	87	93	81	15	86
Yellow Globe	..	93	89	..	15	90
Green-top Scotch	86	70	91	86	15	83
Hardy Green Round	90	94	94	..	10	94
Early Six Weeks	89	78	92	92	9	89
Kales.						
Chou moellier*	81	78	77	78	216	78
Thousand-headed	75	85	79	79	100	80
Buda	74	75	85	92	36	82

* Includes all samples labelled "Marrow stemmed."

Other Seeds.

The average germinations for the different groups—cereals, pulses, &c.—are as follows :—

Oats	77	Maize	92	Sorghum	92
Wheat	92	Tares	90	Sugar-grass ..	80
Barley	84	Peas	93	Linseed	94
Rye-corn	79	Millet	85	Lupins	70

Export and Import of Seeds.

Table 14 shows the quantities and value of the seed impurities and exports for the years 1926–29.

Exports : The only marked decrease was shown in red clover (cow-grass). Both brown-top and cocksfoot show material increases. The export of brown-top is of special interest ; in 1926, 475 cwt. was exported and in 1929 3,473 cwt., the value in the latter year exceeding that of the rye-grass export.

Imports : Increases are shown for red clover, lucerne, rye-grass, and Poa pratensis. The importation of rye-grass is the heaviest for many years, and is no doubt due to rising prices for locally grown seed.

Table 14.—Exports and Imports of Grass and Clover Seeds, 1926 to 1929.

Species.	1926.	1927.	1928.	1929.	
				Quantity.	Value.
		Exports.			
	Cwt.	Cwt.	Cwt.	Cwt.	£
Red clover	4,657	9,628	1,495	994	4,420
White clover	2,115	2,388	835	1,302	10,639
Other clovers	717	928	350	687	3,929
Total clovers	7,489	12,944	2,680	2,983	18,988
Brown-top	475	301	1,131	3,473	30,273
Chewings fescue	13,923	17,418	17,124	16,888	75,614
Crested dogstail	2,309	5,434	4,844	4,500	16,231
Rye-grass	29,546	50,162	20,581	25,915	26,448
Cocksfoot	*	*	496	1,183	7,158
Other grasses	4,685	4,489	3,382	3,116	7,825
Total grasses	50,938	77,804	47,558	55,075	163,549
Total grasses and clovers	58,427	90,748	50,238	58,058	163,549
Total value	£203,798	£257,136	£161,456	..	£182,537
		Imports.			
Red clover	†	†	762	1,288	5,872
White clover	†	†	1,748	1,258	7,251
Alsike	†	†	2,806	1,417	7,630
Other clovers	†	†	1,497	751	6,797
Total clovers	8,283	2,657	6,813	4,714	27,550
Cocksfoot	15,616	5,619	9,145	4,199	13,764
Lucerne	755	527	17	50	312
Paspalum	1,717	1,940	3,026	2,615	21,564
Rye-grass	334	69	20	855	1,625
Timothy	1,989	2,905	4,765	2,843	4,962
Poa pratensis	*	*	51	248	1,298
Other grasses	3,604	1,741	1,839	1,332	7,343
Total grasses	23,835	12,801	18,863	12,142	50,868
Total grasses and clovers	32,118	15,458	25,676	16,856	..
Total value	..	..	£101,373	..	£78,418

* Included in "Other grasses." † Not available.

The assistance of Mr. J. Watt, of the Station staff, in preparing the tabular matter of this report is cordially acknowledged.

Fireblight Control.—By amending regulations under the Fireblight Act of 1922, gazetted on the 3rd July, the Gisborne Commercial Fruitgrowing District is added to the Second Schedule, under which hawthorn must be dealt with at the time and in the manner therein prescribed.

CONTROL OF FERN AND BLACKBERRY ON HILL COUNTRY IN MARLBOROUGH SOUNDS.

FARMERS' EXPERIENCE AT MANAROA.

A. G. ELLIOTT, Instructor in Agriculture, Fields Division, Blenheim.

THE following article gives an account of the system developed by Messrs. Harvey Bros., at Manaroa, Pelorus Sound, for the control of fern and blackberry on hill country. The system may be held to apply to the Marlborough Sounds generally.

The land held by the Harvey Bros. is roughly 3,500 acres in area and of this 1,500 acres are still in standing bush consisting of rimu, matai, tawa, hinau, and pukatea, with typical undergrowth, and carrying red-beech ("brown birch") on the harder ridges. Of the 2,000 acres which were burned and surface-sown about twenty years ago roughly 100 acres are ploughable, and comprise a fan-shaped area fronting Pelorus Sound and into which the two main valleys open. The hill country rises to an elevation of about 2,000 ft., and is made up of approximately equal areas of sunny and shady faces.

It is on blocks of this country that the invasion of bracken hard-fern (*Paesia scaberula*) and water-fern (*Histiopteris incisa*) with blackberry forced the farmers into the present method of control of this secondary growth. On two blocks, one of approximately 100 acres and another of 150 acres, both of sunny aspect, the bracken was a solid mass 4 ft. in height with large scattered clumps of blackberry through it, and with hard-fern and water-fern well established in shaded places around stumps and beside logs.

The average annual rainfall rate of the locality is approximately 63 in.

At last shearing 2,700 sheep were shorn on the property, and the average weight of fleece from these Romney crossbreds was 8 lb., while the average lambing percentage for the year was 90. All sheep were in good condition, and the prices for lambs were equal to the best in this part of the Sounds. A few head of cattle were run, but these are not important factors in secondary-growth control in this district, as will be shown.

DEVELOPMENT OF THE SYSTEM.

In 1910 an area of approximately 1,800 acres, of which 500 acres were in surface-sown grass, was taken up and was then carrying 700 sheep. Bracken became established in the small valleys and gradually invaded the open areas, and to cope with this the old method of burning the fern and grazing it with sheep and cattle was tried, but without success. In order to carry the sheep the flats were ploughed and sown in permanent pasture, and more bush was felled. It was soon realized that control of secondary growth on the flats presented no great difficulty, but that some better method for dealing with the hill country had to be evolved, as by this time the fern and blackberry had secured a good hold on those areas.

In 1914 a further block of 900 acres, of which 700 were felled and surface-sown and carrying 600 sheep, was taken up with a result that that year the farmers had 1,300 sheep averaging a 6-lb. fleece with a lambing percentage of 87. During the next ten years burning-off of fern and blackberry, accompanied by a small amount of surface-sowing, was continued with but little success. Whole blocks which formerly carried one sheep per acre were at the end of ten years producing nothing but secondary growth.

In 1924 a reverted block of 35 acres of shady face was tackled; the heaviest blackberry clumps were chopped down, and the whole burned off during the first week in March. The area was then surface-sown with a mixture of perennial rye-grass, crested dogstail, brown-top, and white clover. During the winter it was lightly stocked with one sheep per acre, but during the summer carried three sheep per acre, and now does this regularly from October until the end of February. At present the constituents of the pasture are brown-top, crested dogstail, white clover, suckling-clover, and Yorkshire fog, with winged thistle and hydrocotyle in patches. The only traces of fern are in places inaccessible to sheep under the edges of logs, and there has been quite an effective clearance of blackberry.

In the following year a 37-acre block of part shady and part sunny face was similarly treated, and sown down with the same mixture at the rate of 10 lb. per acre. The result secured here proved quite satisfactory and convinced the Harvey Bros. that their method of sowing such mixtures and stocking with sheep was likely to be profitable.

The following year a third block of 60 acres of shady face was treated, but in this case cocksfoot was included in the surface-sown mixture with good results. The same year also a small block on the sunny face was brought back by the same method.

In 1928 a large block of 250 acres on the shady side was burned off, and took a month to surface-sow with the following grass mixture: Danthonia, 600 lb.; perennial rye, 1,320 lb.; Chewings fescue, 120 lb.; crested dogstail, 376 lb.; brown-top, 100 lb.; cocksfoot, 480 lb.; white clover, 300 lb.: total, 3,296 lb.

This works out at approximately 13 lb. of seed per acre, and since the cost of the seed totalled £113 it comes out at just over 8s. per acre.

It is estimated that two men can pack out seed and sow 10 acres of this country per day, and it is important that the sowing should be done as quickly as possible. The area was lightly stocked with one sheep per acre from the middle of June until October, when it easily carried two sheep per acre. The inclusion of danthonia and Chewings fescue has been very beneficial, and these will be included in the sowing of future burns. Danthonia, although comparatively slow to establish, is of value particularly on the higher parts of the block, while Chewings fescue is probably one of the few grasses which will take on the hard beech slopes. It is doubtful whether this method of sowing so large an area will be so successful as was the case with the smaller earlier sown areas, as it is obvious that the sheep will congregate on the lower slopes, with the result that the growth of young fern and pasture grasses will not be controlled on the higher faces.

On all these areas the actual control of the young fern on the burn is done by hoggets, which are bought in when required and sold forward.

For the last three years they have been disposed of at a profit of 2s. per head, but it is obvious that their real value lies in secondary-growth control. The cattle merely have access to the blocks during the winter, but are not shut in on any of the areas as a definite factor in dealing with fern and blackberry.

Main Points summarized.

The main points in the system practised by the Harvey Bros. are as follows:—

(1) Allow secondary growth to get away for at least three or four years, so that a good burn may be secured. By this time the soil is opened up by the fern-roots, and with the ash secured from the burn a good seed-bed results. At Manaroa burning is done during the first two weeks in March.

(2) Cut all large bushes of blackberry to allow sheep to get among the burnt sticks to graze on young shoots and surface-sown grass. The cost of blackberry cutting is approximately £2 10s. per acre.

(3) Sow up to 12 lb. per acre of a grass mixture consisting of cocksfoot, danthonia, Chewings fescue, perennial rye-grass, crested dogstail, and white clover.

(4) Depending on the season, graze lightly with hoggets about two months after sowing, and increase the stocking until the growth is held. Grasses are not allowed to seed and the young fern and blackberry is nipped off early. The average spring and summer stocking at Manaroa is three and a half sheep per acre up to the end of February. Bought-in hoggets are held on the new blocks and remain there through the winter.

(5) The cheapness of the method is obvious, as country originally carrying one sheep per acre and later reverting to fern can in two years, with an expenditure of 8s. per acre for seed, to which should be added 2s. per acre for sowing, be brought back so that it can do two sheep per acre well. The bought-in hoggets, used solely for secondary-growth control, are sold at a profit.

(6) The method has proved successful for handling fern and blackberry on both sunny and shady faces.

Sheep will not eat either the hard-fern or water-fern, but at Manaroa so far such good burns have been secured that the recurrence of these growths has not proved a problem. The water-fern disappears when its shelter is burned off, and if the hard-fern reappears it can be dealt with by piling rubbish on it and burning it off with a hot fire. Such areas will again be surface-sown with the mixture already specified.

While it is not suggested that the control of fern and blackberry in the Marlborough Sounds is so difficult a problem as it is in the King-country and various other parts of the North Island, the general conditions in both places are somewhat similar, and the experience of the Harvey Bros. in this important matter is published for the benefit of others faced with this problem. It may be noted that a point of difference between the Manaroa system and general control practice in the North Island lies in the use of hoggets—cattle and grown sheep being required in the North to stand up to the work.

SEASONAL NOTES.

THE FARM.

The Coming Month.

PROVIDED weather conditions are favourable, workers in our farming world are generally very busy during September. Indeed, the farmer who is not faced with more work in September than he can deal with conveniently either is quite fortunate in having his work well advanced or is most likely negligent in regard to operations which deserve his attention. Successful farmers follow two definite rules in regard to September work. They firstly make the best possible use of all available time, but secondly, while they are eager to get on with their work, they do not allow this to lead them to the doing of work when it should not be done on account of wet conditions. At the time of writing the indications are that it will be possible to proceed with spring farming operations with greater freedom than usual.

Pasture-management in September.

An important point in connection with the management of pastures during the spring arises from the fact that, particularly in dry years on poor soils, heavy early spring grazing may do considerable harm and be directly responsible for the increased prominence of daisies and other weeds —a result which it may take many years to remedy. Very heavy early spring grazing also may readily have an adverse influence on the persistency of pasture species, such as cocksfoot, which early develop flowering shoots. Indeed it is probable that the persistency of all valuable pasture plants is decreased by such grazing. It is noteworthy that rosette plants, such as catsear, dandelion, and rib-grass, which are ordinarily objectionable in pastures, are suited better than most valuable pasture species to withstand close grazing in the spring.

The frequency with which transformations involving decrease of cocksfoot and increase of flat weeds occur in our pastures are indicative of how often harmful effects are wrought by unduly severe early-season grazing. Further, a decided advantage from the use of the better strains of ryegrass and clovers is that they are much more capable than are the other strains of a long life, even on heavily grazed pastures.

It needs to be clearly understood that the type of grazing to which the foregoing statements refer is really hard grazing as distinct from desirable close grazing, which is valuable particularly later on in the spring. The proper way of avoiding undesirably hard grazing at this period is the provision of special feed, by the use of which it becomes possible to spell a portion of the grassland. Further, since one may be forced to grazing a pasture to an unduly hard extent in the early spring, it is well to remember that the ill-effect of this practice may to a considerable measure be eliminated by suitable top-dressing with phosphates, together possibly with 1 cwt. per acre of a nitrogenous manure such as sulphate of ammonia. Such top-dressing will tend to restore the vigour of the plants which have been weakened by the severe early grazing.

It is extremely likely that the coming of September will find a portion of the grassland still in need of harrowing. Usually it is very advisable to allow of no delay in the harrowing of pastures in which stock have been fed during the winter. In particular, fields from which it is intended to harvest hay or ensilage during the coming summer should be thoroughly harrowed a short time prior to the date of closing them from grazing. A principal aim of harrowing grassland in September is the proper distribution

of stock droppings, and if this distribution is not satisfactorily effected at relatively short intervals it will become increasingly difficult to avoid patches of rank, unrelished growth during November and December, when usually proper control of the length of growth of pastures is most difficult.

There is often occasion to sow pasture-seed mixtures in September. This is especially true in respect to short-rotation or temporary pasture mixtures, of which rye-grass is the principal component. Generally it is desirable to sow permanent-pasture mixtures without any companion crop, while short-rotation mixtures may well be sown with either oats or barley. Companion crops to young pastures are often somewhat misleadingly termed "nurse" or "cover" crops, because of the impression that they afford valuable shelter to the young establishing plants. Actually the shelter which such crops afford is apt to be harmful rather than beneficial, because they tend to shut out supplies of the vitally necessary sunlight and to utilize soil moisture which would be of value to the young pasture. Hence establishment of pastures with companion crops is frequently poor. The more dense and luxuriant the companion crop the more is it apt to smother the young pasture. Therefore it is generally inadvisable to seek a maximum crop of oats or barley with which young pasture is sown down, but is often good practice to sow a relatively small amount of cereal seed with the pasture-seed mixture; frequently 1 to 1½ bushels of the cereal seed will suffice in place of the standard 2 to 2½ bushels. Further, the smothering effect of cereals on young pastures sown with them is lessened if the cereal is harvested for ensilage or chaff instead of for grain, which involves cutting the crop at a later date.

Details of the constituents of seed mixtures suitable for the production of permanent pastures under various conditions were given in these notes in the *Journal* for February last. Over a wide range of conditions the following mixture is suited for the production of a short-rotation pasture of two to three years' duration: Italian rye-grass, 15 lb.; perennial rye-grass, 15 lb.; red clover, 4 lb.; white clover, 2 lb.: total, 36 lb. per acre.

A popular and suitable seed mixture for the production of temporary pasture of one to two years' duration consists of Italian rye-grass, 25 lb., and red clover, 4 to 6 lb., an acre. When a spring-sown cereal is the companion crop the grass seed may be sown in September, after the cereal which was sown in August is above ground, or it may be sown shortly after the cereal is drilled if this is in September. In the latter case the land should be rolled after the drilling of the cereal; then the grass-seed and probably also fertilizer should be broadcast on the rolled surface and covered by a stroke of light tine harrows.

Valuable aid in the securing of satisfactory pasture establishment may, at times, be obtained from judicious top-dressing. It can be accepted as a rule with few exceptions that the applications of a dressing of superphosphate shortly after the sowing of a pasture mixture will prove worth while. The addition to the super of sulphate of ammonia at the rate of 1 cwt. per acre is likely to prove profitable, particularly if the soil is cold, as probably will be the condition in Southern districts. The extra vigour which such top-dressing serves to give the young pasture plants is likely to make its influence felt for a long while in their production.

Top-dressing in September of fields which have not as yet been treated will prove beneficial. But it becomes a somewhat open question whether greater benefit would not be obtained by delaying such top-dressing until November or thereabouts. The answer to the question will depend on the top-dressing programme which is being followed, on the feed prospects for the coming season, and on labour conditions. If top-dressing is being done twice annually, then an August–September dressing will fit in well with autumn dressings. If the feed in prospect promises to be sufficient

for all requirements up to Christmas, then the case for September top-dressing is weakened. On the other hand, there may be a full programme of summer work in sight to which it would be inadvisable to add any labour of top-dressing.

Generally, fields which are being set aside for hay, silage, or seed production should be top-dressed just before they are closed from stock if they have not been dressed fairly recently. Such fields should also be cleaned up thoroughly and made safe for harvesting equipment.

Special Provision of Feed.

The results secured, not only in the coming season but in the one following that, will be governed to a considerable extent by the way in which farmers undertake special forage provision to supplement the feed from pastures during periods of scant grass-growth. Some general aspects of forage provision which are frequently ignored in actual practice—and this usually with somewhat unhappy results—will require attention in the near future.

One of the principal of these neglected aspects arises from the fact that pastures often fail to meet feed-requirement by stock much earlier in the season than is commonly thought to be the case. For instance, while many farmers are in the habit of devoting all their attention to February feeding difficulties, actually pastures often begin to prove insufficient as early in the season as Christmas, so that there is a period of inadequate feeding to which little attention is given. In dairying particularly it is a period which should receive special attention, for an avoidable fall in production at that stage is reflected detrimentally in the production for the remainder of the season. Some of the most ready means of providing for the initial period of summer feed-shortage were indicated in these notes last month.

A second matter calling for attention is the fact that the most marked feature of the normal summer feed provision is not its deficiency in quantity but in quality. Usually the stock are given access to plenty of feed of a sort which is not the sort that they particularly require. The feed provided in summer is frequently too woody or fibrous, too indigestible, and too poor in mineral matter—three weaknesses which may be summed up by saying the feed is too mature. The remedy is the provision of fresh young or non-woody forage. In practice it is of much assistance to keep the pastures short by means of ensilage production and rotational grazing. Further, special forage cropping should be planned so that the whole of the area devoted to any of the crops which increase in woodiness as they mature should not be sown at one date. The crop should be sown at suitable intervals, so that in succession different portions of it will come to the right stage of growth for feeding, a continuous supply of non-woody digestible feed being thus secured over a relatively long period. This is advisable in the case of such crops as oats, maize, and millet. One of the great merits of roots is their high digestibility, together with the fact that this is not materially influenced by maturity. This largely explains the outstanding value of the soft turnip as a summer forage.

Summed up, to make the summer forage position sound one should plan for a succession of feed containing the minimum of fibre. Much has often been made of the need of succulent feed, which is of value not because it contains high proportions of water but because it is markedly digestible.

It is wise to lay plans to produce feed in excess of requirements; by doing this one is placed in a better position to face unexpected crop failures. Further, a little extra effort is always justified, because it is such a serious matter to be short of feed at critical seasons, while on the other hand a supply of surplus feed may enable one to grasp especially favourable market opportunities, and ordinarily it never need be wasted.

In planning the forage cropping for the season, attention should be given to the requirements not only of the main class of stock on the farm, but also to subsidiary classes such as pigs and poultry on the dairy-farms, together with cows on the farms on which grain or sheep are the main consideration. A great many of the large number of farms on which dairy cows, poultry, and pigs are side lines obtain very poor returns from these, primarily because of poor feeding of such stock. Now is the time to consider steps that will remedy this common occurrence.

Crops such as mangels, which require considerable attention, should preferably be located in a position convenient to the homestead, where they are much more likely to receive necessary weeding and cultivation than if they are grown in some out-of-the-way situation.

Particularly in the case of high-priced land, in drawing up the programme of forage-production the objective should be heavy yields secured by treating a relatively small area in a thorough manner, in preference to a larger area of lower average yield. Only an area that can be thoroughly cultivated should be attempted, for without thorough cultivation expenditure on good seed and manures is to some extent wasted.

Lucerne and mangels are two crops which should be grown to a much greater extent than they now are. Preparatory cultivation for both should be commenced soon if it has not already been started. In selecting the mangel area it is well to remember that this crop is a heavy feeder, and that hence it should be allotted land which is naturally of high fertility or which has been enriched by the addition of suitable animal manure. Because the mangel is remarkably free from serious ravages of pests and disease, it may often be grown season after season on the same area of land. When it is not desirable to break up grassland this is a distinct advantage. When mangels are to be grown for some years in succession on the one area the land should be freely dressed with farm or artificial manure to maintain its fertility.

A permanent, vigorous lucerne crop is of such value that the area selected for it should be highly fertile. Poorly drained conditions are to be avoided for lucerne. If at this stage it is proposed to plough old pasture for lucerne or mangels, one deep ploughing will almost certainly give best results, provided the furrows are turned well so as to bury completely the surface layer. This usually contains a numerous population of weed seeds, which if brought to the surface by a second ploughing, would tend to give much trouble in the subsequent crops.

General Crop Work.

Except where land is too wet, no chance to push ahead with the sowing of cereals should be missed. The references to cereals which were contained in last month's notes are generally applicable to work which calls for current attention.

Land for the potato crop which was skim-ploughed in the autumn should be ploughed deeply about September in preparation for the subsequent cultivation necessary to give a suitable seed-bed. At this stage it is well to bear in mind that the potato thrives in a loose rather than in a compacted soil. When the cereal sowing has been done the implements may well be kept busy on land for rape and root crops. By cultivating such land in good time one most readily secures the type of seed-bed which is required—that which is fine from the bottom upwards, as distinct from the fine surface layer of soil underlain by large hard clumps, which forms the seed-bed often obtained when cultivation work is done too late.

It is often well to close up lucerne areas in September in order to obtain an early cut. An early cut is valuable because it removes plants which harmfully invade the lucerne in the spring, and which do not appear prominently in subsequent growth during the season.

Utilization of Feed.

The feeding of stock wholly or almost wholly on roots, which generally is inadvisable, is especially so in the August–September period. When persisted in at this time it may lead to the disorder known as redwater, which has often caused much trouble in districts where farmers have made a practice of feeding with roots alone. The roots should, if possible, be supplemented by hay or chaff.

Cows during the early part of their milking-season require feed rich in protein. Short fresh grass fills the bill in this respect, but often in September the available supplies of it are insufficient to meet the needs of the herd. If it is proposed to feed hay or ensilage at this period, importance attaches to the fact that such material made from grass that was at the seeding stage when mown is relatively poor in protein. On the other hand, clover and lucerne hay usually are rich in protein. Hence, such hay should be reserved for use in the August–September period. Failing lucerne or clover hay, the ensilage or hay that was made from the leafiest and youngest pasture should be reserved for this stage. If the grass-supply is poor and hay and ensilage not freely available, it may prove well worth while to feed to milking animals some concentrates which are rich in protein, such as linseed-cake, oats, or bran.

—R. P. Connell, M.A., Fields Division, Palmerston North.

THE ORCHARD.

Early Season Spraying.

In preparing the season's spray programme one is guided largely by the results of the previous season's operations, and it must be borne in mind that an infection of disease does not die out with the fall of the leaf, but may confidently be expected to reappear in the following season—perhaps even to a greater extent.

We have not yet reached the stage where one specific can be prescribed for all infections, but each disease must be treated according to its mode of reproduction, method of deriving nutriment, time of development, &c., and the combative measures applied accordingly. The life-cycles of the various diseases are sufficiently well known to make it possible to anticipate their appearance during well-defined periods, for the influences which stimulate the host plant into activity act in a similar manner on the disease, and the visible development of the tree provides a fairly reliable guide to the progress of the invisible parasite. Success will depend upon the timely application of the sprays, the thoroughness of the work, and the use of the correct material properly mixed at the strength necessary to do the work without injury to the tree, and, in addition, the maintenance of a system of orchard sanitation by the removal and destruction of dead and diseased wood and mummified fruit.

Advantage is taken of the leafless condition of the trees to apply stronger sprays than could be used during the growing-period, with a view to reducing the existing infection and making conditions unsuitable for the establishment of fresh disease before the next spray is due, the limited effective life of the spray rendering a continuation of the treatment necessary. Although not necessarily an annual spray, the first one is usually an insecticidal oil to combat scale insects, red mite, aphis, the pupæ of moths, &c., and as a cleanser and stimulant to the bark. On stone-fruits it is applied at 1–15 strength during the dormant period, as late as possible, but at least a fortnight before bud-movement, so as not to lessen the adhesiveness of the fungicide which will be required at that time. Some

growers delay the oil spray until petal-fall, when they use a strength of 1–30, but this interrupts the fungicide programme, and lessens the control on brown-rot, &c.

Pip-fruits may receive the oil spray at 1 in 12 or 15 at bud-movement. There is an increasing tendency to apply the oil at a later date, using a lighter concentration as growth increases, but this involves a certain amount of risk of burning and russeting, and at least two weeks should elapse between the use of oil and lime-sulphur. An alternative method is to use lime-sulphur, 1–12, at bud-movement, and oil, 1–20, at green-tip. The first fungicide on stone-fruit may be either lime-sulphur, 1–15, at bud-movement, or bordeaux, 8–6–40, for leaf-curl, shot-hole, bladder-plum, &c. If scale or red mite is present the lime-sulphur will be the better spray. At the pink stage, just prior to the opening of the blossoms, lime-sulphur, 1–50, or bordeaux, 3–4–40, follows the second fungicide. At petal-fall it is advisable to discontinue the commercial lime-sulphur and use either self-boiled lime-sulphur, 8–8–50, one of the precipitated sulphurs, or dry mix. Dry mix has given good control over brown-rot, but for use in small quantities one of the wettable or atomized products will probably be more convenient. The times of application will be governed by weather conditions; frequent rains may wash the spray off the tree, but not more than a fortnight should elapse between sprayings.

With pip-fruits the green-tip spray is perhaps the most important in combating black spot. From then onwards spore-discharge commences, and the spray goes on as a barrier to its establishment. Delicious, Dougherty, Brighton, and Ballarat apples may receive bordeaux, 6–4–50, at green-tip, and other varieties lime-sulphur, 1–10 or 12. When the clusters of blossom-buds have separated prior to opening lime-sulphur, 1–35, should be used, and at petal-fall the first combination spray for fungi and insect pests will be lime-sulphur, 1–120, plus precipitated sulphur, 10 or 12, arsenate of lead, nicotine sulphate, 1–800, plus spreader.

For black-spot on pears, after the green-tip application of bordeaux, 6–4–50, sprayings may be carried on at the usual intervals with bordeaux, 3–4–50, with the exception of P. Barry, Winter Cole, and Josephine, which may have lime-sulphur, 1–35, at open-cluster, and subsequent sprays of lime-sulphur, 1–100.

Cultivation.

Where cover-crops are still standing they should be ploughed in without delay. During the process of decomposition of vegetable matter losses of nitrogen take place and the soil is actually less capable of supporting growth than it was before the crop was ploughed in, so that if the ploughing is delayed unduly there is a liability to depression of growth during the most favourable growing-period. Too frequent deep cultivation on thin soils in areas of light rainfall may have an injurious effect on the trees. On such soils root-action is not vigorous, and development is dependent upon close contact between the roots and the moist soil-particles. The creation of air pockets in the vicinity of the roots consequent upon ploughing, or any disturbance of the roots during their period of activity, must have a detrimental result. The better practice would be to plough the areas occupied by the roots in the autumn or early winter, and thereafter concentrate on the maintenance of a surface or dust mulch for moisture conservation.

Grafting.

Conditions will be favourable for grafting when there are distinct signs of activity in the stock as indicated by the swelling or bursting of the buds The grafts or scions, having been removed and stored while in a dormant state, will be less advanced than the stocks. One of the main essentials to successful working is a suitable knife thoroughly sharpened to a smooth

even edge. Without this it is impossible to make the smooth even cut required to ensure intimate contact between the stock and the scion, without which the union cannot be effected.

The most satisfactory mode of grafting is by what is known as the whip or tongue graft. As it is necessary that the stock and scion should be somewhere about the same thickness the use of this method is limited when working over old stumps, but it can be employed in grafting the smaller branches. The methods more commonly used are the notch and rind grafts. The notch is made by cutting a vertical right-angled notch in the top of the stump, about 2 in. long, tapering to a point at the bottom, and just wide enough at the top to accommodate the graft when it has been cut to fit. This provides two surfaces along which the union can take place, and a satisfactory join results. It is necessary that the two inner barks should be in contact, and the graft is held in position by the aid of one or two panel pins and binding.

The rind graft has the advantage of being easier and more rapidly executed. The stump having been freshly cut down to the desired height, a perpendicular cut is made in the bark from the top edge and extending about 2 in. downwards, and with a slight twist of the knife the bark is slightly raised on one side to facilitate the insertion of the prepared scion. A long slice is cut from one side of the lower end of the scion, tapering to a point like a wedge. A thin slice is run off the side which will be against the undisturbed bark, and the scion is ready for insertion. It is then pushed down to the full extent of the cut surface, pressed firmly up against the wall of bark, and held in position with one or two panel pins.

In all grafting it is essential that the cut surfaces should be in close contact, and to this end the parts are tightly bound with raffia or other suitable tying-material, after which the graft is painted over with hot grafting-wax to exclude air and moisture, and the top of the graft similarly treated. The raw surfaces where limbs have been removed and the tops of the stumps should be painted with wax, tar, paint, or any suitable substance, as a protection against fungi and to assist healing over. In cutting the graft, which need have no more than three eyes, it is advisable to have one eye as near the bottom as possible, and the top eye should have an outward tendency.

Grafting-wax may be made by mixing 2 lb. of beeswax, 2 lb. resin, and ½ pint of linseed-oil, heated together until the wax and resin are completely dissolved. If too stiff when melted add more oil. This wax must be applied hot, but overheating, by making the mixture too thin, is not economical and may burn the bark.

Manuring.

Spring applications of sulphate of ammonia, nitrate of soda, or other nitrogenous fertilizers may be made as growth commences. Overfeeding with nitrogenous manures may upset the balance in fruiting trees and develop the vegetative tendency to the detriment of fruit-production, but as a stimulant in early spring such fertilizers have effect if judiciously applied.

Citrus-culture.

Planting.—Early September is usually the most satisfactory month for planting citrus-trees. Providing the soil conditions are satisfactory, the increasing warmth and brighter days will stimulate the young trees into action, and they should be well on the way to becoming established before the dry weather sets in.

In common with other trees, citrus require a certain amount of pruning at planting or before the expiration of the first year if a desirable type of tree is to be formed. Most young orange and lemon trees as sent out

from the nurseries have a head consisting of numerous shoots of varying strengths, but without much semblance to orderly arrangement. If permitted to develop unaided, in the course of time some limbs will assert themselves and ultimately form a framework, but in the process much valuable tree-energy is wasted in wrong directions, and the grown tree does not lend itself to economic handling. The first consideration in starting a young tree should be to secure an adequate length of stem. Considering the drooping nature of the growth and the hand labour necessary to cultivate under the branches, up to 2½ ft. would not be too high, but as this may be unattainable the alternative will lie in thinning out the weakly shoots and stimulating two or three well-spaced ones, in order to raise the head to the desired height before anything in the nature of permanent branching is permitted. Lemon-picking is a slow business, but it can be considerably facilitated if some system of orderly arrangement of the limbs is carried out while the tree is young.

In planting the hole should be considerably larger than the ball of earth surrounding the roots, and deep enough to allow the lower soil to be replaced with good surface-soil. If dry the ball of earth should be thoroughly soaked in water immediately before planting, and any long protruding roots spread out in the hole. Generally it will be found that if the top of the ball is about 2 in. lower than the surrounding surface the tree will be planted at the right depth. Two or three handfuls of blood-and-bone manure may be dusted in when replacing the soil, which should be loose and friable and well trodden to firm the tree and exclude air pockets, except the top 2 in. or 3 in., which should be left loose.

Pruning.—This operation should be pushed on before the spring growth commences. The presence of a certain amount of fruit will hamper operations, but the prospective young growth and blossoms will benefit. Oranges, mandarins, and pomeloes will require mostly thinning of light growth, partly to reduce the succeeding crop and partly to improve the quality by increasing the amount of light and sun. Lemons, with their different habit of fruiting, will require more detail work in cutting out old, diseased, or exhausted fruiting-twigs, opening up the tree, and stopping or suppressing undesirable shoots. In the production of commercial fruit of good type the elimination of the old fruiting-wood is an important item. This is usually found in the least accessible part of the tree. The fruit, if any, produced on it is of poor quality, and its presence is more detrimental than beneficial. The best fruit is produced on comparatively light twiggy growth inside the tree, and its position is not conducive to long life. The most productive type of wood is that of the somewhat crooked horizontal laterals, and in pruning these are maintained and the shoots approaching the perpendicular are removed, cutting as close as possible to their point of union with the larger branch so as not to leave stubs to die back. Systematic thinning of the light brush will reduce the quantity of cull fruit, render disease-control easier, and greatly facilitate picking-operations.

Cultivation and Manuring.—Cover-crops should be ploughed in without delay, and manuring proceeded with. Blood-and-bone may be supplied to bearing trees according to condition, at from 1 lb. to 5 lb. per tree broadcast, and preferably disked in before ploughing. Nitrate of soda or other quick-acting nitrogenous manures give best value when applied at the time of the main blossomings. The principal requirements of lemons appear to be mainly nitrates (with a large proportion in bulky form as supplied in leguminous cover-crops), some phosphates, and occasional liming to counteract any acidity arising from green manuring and for the formation of nitrates by the nitrifying bacteria.

—G. H. McIndoe, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

Hatching-time.

On all poultry-plants, whether large or small, the aim at the present time should be to get every possible chick hatched out by the end of September, or early in October at the latest. It should be remembered that if chickens are to thrive and return a maximum of profit they must be well over the brooder stage before the hot summer weather sets in. The production of late-hatched stock is the weak link on many unsuccessful plants, and therefore one cannot emphasize too strongly the importance of hatching the young birds at the right season and also of giving them the best of attention from first to last.

The Male Breeders.

In last month's notes some advice was given in regard to the care and management of the breeding-birds, and too much importance cannot be attached to this phase of the operations. It is particularly important, now that the season is advancing, to keep a careful watch on male birds, for it is quite common for a good cock who is too attentive to the hens by allowing them to have the greater bulk of the food to decline in health, with the result that a high proportion of infertile eggs will be produced, as well as others containing weak germs. It is a good plan, therefore, to frequently handle the male birds, and if any are found which are not in the very best form they should be taken out of the pen and fed by themselves or be replaced by others. Strong chicks imply strong germs, and strong germs come only from healthy vigorous breeding-stock.

When a male bird has to be taken out of the breeding-pen for the reason given it is a mistake to put him by himself, as he will eat better and come back to a breeding condition much more quickly if given the company of one or two hens. Many of the failures in the work of hatching chicks are put down to incubators, whereas the fault is often traceable to the breeding-stock. Generally with eggs containing the desired strength of germ, and with the improved incubators now available, together with the increased knowledge as to their working, the securing of at least a fair hatch is generally assured.

Brooding Points.

No hard and fast rules can be laid down in regard to handling brooder chicks. If success is to be achieved the individual concerned must study out things for himself. In other words, it is on strict observance of the many little details connected with this important work that success largely depends. The first essential is to prevent chicks from becoming chilled. Chill, with its resultant evil effects, is responsible for more brooder losses than practically all other causes. It is not to be inferred, however, that insufficient provision of warmth is the chief cause of chill; on the contrary, overheating is more responsible for trouble in this respect. It stands to reason that if the chicks become overheated by night they will be particularly susceptible to chill immediately they leave the brooder in the morning. Therefore it is especially necessary to take climatic changes into account and to amend the methods of management accordingly.

It should be remembered that the slightest mistake made, especially during the early stages, cannot be later rectified, and trouble is almost sure to follow. For instance, if chicks become chilled bowel trouble soon appears. Once this disorder sets in little or nothing can be done, and it will generally pay in the long-run to destroy the whole brood of chicks rather than try to doctor them. Most of the troubles in connection with rearing brooder chicks are due to neglect of some essential detail.

Feeding Experiments.—While proper temperature and ventilation are among the chief factors in rearing brooder chicks, the matter of providing

the right class of food must not be overlooked. The main point is to feed nothing but sound wholesome food. There are numerous mixtures that will give good results, many of which have been tried at the Wallaceville Poultry Station. The results obtained show that the manner in which the food is supplied is almost as important as its quality. In one experiment two lots of chicks bred from the same parent stock and hatched in the same incubator were placed in different brooders of similar make. Both lots of chicks received the same class of food and similar detailed attention in all respects, excepting that the first lot was provided with five meals a day over the period during which the experiment was conducted—five weeks—whereas the second received four meals for the first ten days and three meals for the remainder of the period. From observations made, Lot 2 through all stages of the experiment showed by far the most vigour and from all view-points developed into better stock than was the case with Lot 1; in fact, these chicks were constantly on the move and gave every indication of possessing good health and sound development, while the mortality which took place was practically negligible. On the other hand several of the chicks in Lot 1 died, while others were destroyed owing to the impaired condition presented and general failure to thrive. From the outset the chicks in Lot 1 were decidedly sluggish, and were inclined to mope under the brooder even on the hottest days, nor did they take the necessary exercise to ensure proper development. The experiment goes to show that, apart from any particular ration provided to brooder chicks, they should be kept more or less on the hungry side during the early stages of their development; otherwise they are apt to suffer from digestive and other troubles as a result of not being encouraged to take plenty of exercise, which is an all-important essential for their welfare.

The value of fresh skim milk for young chickens has also been demonstrated at the Wallaceville Poultry Station. During last season some lots of chicks were given milk to drink, while others were supplied with water. In all cases the milk-fed birds made by far the better development; indeed, the best chickens that were reared during the season received nothing but milk during the whole of the brooder stage. Results also indicated that it is a mistake to supply sweet milk one day and sour milk the next, as this is apt to bring on bowel trouble. Personally, the writer prefers it to be sweet at all times where young chickens are concerned.

Cleanliness.—If any requirement should be emphasized more than another in connection with rearing brooder chicks it is that of cleanliness, to prevent the chicks becoming infested with parasitic life. This necessitates the frequent removal of droppings and the spraying of the quarters with a reliable disinfectant. Unclean quarters are bad enough in themselves, but when this is accompanied by overcrowding failure to rear the young birds is almost sure to result. It should never be forgotten that it is more profitable to rear a few chicks properly than many indifferently.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

Early Season Examination of Colonies.

With the advent of warmer weather advantage should be taken of the fine days to make a preliminary examination of the hives. Provided that the colonies were queen-right in the autumn and had ample stores for the winter period, very little harm can come to them during the opening months of the spring. It is not sufficient, however, to conclude that all is well because the bees are flying freely and numbers of them are carrying pollen into the hives. These activities obtain even up to the point of starvation, and if taken as a guide to the condition of the hives may end

in wholesale losses. To ensure, therefore, that all is well and conditions right for their progress a critical examination should be made as early as possible. Although it is an advantage to postpone the spring examination until the bees are working fruit-bloom and early nectar plants, if it is thought the colonies need attention the work should not on any account be delayed. It must be remembered that the drain on the stores is enormous once brood-rearing has commenced. Everything should be in readiness before opening up the hives. The smoker should be going well, and the beginner would be well advised to protect himself with a good bee-veil properly adjusted.

Breeding.

Normally in September colonies should have a good quantity of sealed brood. If, however, the absence of brood is noted the indications point to a poor queen or that the hive is queenless. To attempt to carry such colonies through the spring months will lead to serious trouble, as they stand in danger of getting robbed out. It is a far better plan to unite such colonies than run the risk of disturbing the whole apiary. A simple method of disposing of weak and queenless hives is to unite them with strong ones, and this may be carried out by placing a sheet of newspaper over a strong colony and putting the hive to be united on the top of the paper. In the course of a day or two the hive may be examined to see that the colonies have united. Should the paper be intact it must be torn in several places, when it will be found in the course of a few days that the colonies are working peaceably. It is essential that breeding should be kept steadily going, so that the colonies will be strong in young bees to take advantage of the first flow of nectar. Food and warmth are important factors in inducing breeding, and these must have the constant attention of the beekeeper during the spring months.

Food-supply and Feeding.

As already indicated, the spring is the most critical period of the year for the beekeeper, and the success or otherwise of the season's work will depend almost entirely upon his efforts to guard against the losses attendant upon starvation. Large losses occur annually through neglect in this direction. When breeding is in full swing a considerable amount of food is used up daily for feeding the brood; and, unless the weather conditions are favourable to enable the bees to work the early spring blossoms, it is essential that the food-supply be augmented. The amount of nectar gathered when the weather is favourable, in conjunction with their stores, will tide the bees over long periods, but if bad weather follows, colonies will often be reduced to a state of starvation before the owner is aware of their condition. If on examination a colony is found with insufficient stores to meet requirements preparation should be made to feed at once. It is not a safe policy to keep a colony at starvation-point, as this will prevent the rearing of a succession of young bees to take the place of the rapidly dwindling number of workers at this period.

There are many feeders on the market which can be utilized for the purpose of supplying food. The division-board feeder is the best to use at this season, as it will serve the double purpose of feeder and division-board in cases where the colony is not strong enough to occupy all the frames in the hive. When making an examination of a hive to note its condition the feeder should be placed in the hive in readiness if it is anticipated that artificial feeding will have to be resorted to at a later period. All feeding should be carried on within the hives. Especially guard against feeding at the entrances, as that will surely produce trouble. Place the feeder on the warm side of the hive, and in cases where the clusters are small the feeder can be inserted in position next to the cluster.

A point to remember in connection with feeding is that it creates an artificial flow and is stimulating, and, when started, it must be carried on

until a natural flow from the fields sets in. If there is a suspicion of disease in the apiary, do not attempt to feed honey. In any case it is not wise to use honey taken from another hive, as it is impossible to be sure of its source. Feed only the best white sugar. It is a good plan to feed in the evening, as the discovery of the syrup excites the bees, and the colony has time to settle down before the morning, and there is less likelihood of the other colonies learning the cause of the excitement. A syrup composed of two parts of water to one of sugar, fed slightly warm, will prove the best artificial feed for bees in the spring.

Detection of Foul-brood.

As suitable weather permits, every hive should be opened, one at a time, and a strict examination made for symptoms of foul-brood. If it is present, do not fail to mark colonies for treatment. Mild cases can be treated at a later period in the season, but if a colony is badly affected it is by far the safest plan to sulphur the bees and remove the combs to a place of safety. These combs can be converted into wax when a sufficient number warrant the undertaking. If isolated capped cells are discovered, these should be treated as suspicious. Healthy brood-cells are convex in form, bright in appearance, and in contrast differ greatly from diseased cells. These latter are slightly darker, concave in form, and are frequently perforated. Diseased cells of last season's production are usually so shrunken in appearance as to be easily detected, whether they are in an isolated position or surrounded by healthy brood.

Precautions against Robbing.

Every precaution must be taken to prevent robbing getting a start in the apiary. Robbing may be caused by exposing combs too long when manipulating the hives, by careless feeding, and by the presence of weak and queenless colonies. These latter should not be tolerated, and the other causes can be obviated by care and attention. On no account should combs be exposed for long intervals, and if feeding has to be undertaken it should be deferred until late in the day. The excitement caused by feeding attracts other bees, and once they have tasted of the forbidden sweets they will continue to molest the hives for many days. As soon as robbing is detected it is far the best plan to postpone all operations in the apiary, and the entrances to the hives should be contracted at once. If a colony is in danger of being robbed it may be saved by piling wet grass in front of the entrance. Robbers are less likely to enter a hive so protected. Very little trouble, however, will be experienced by robbing if it is not allowed to get a start; prevention is the best plan in all cases. On no account spill syrup near the hives; do not leave combs lying about; and try to avoid weak and queenless colonies. One will then not be troubled with robbing.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

Management of Tomatoes under Glass.

THE success of the tomato crop under glass, whether in houses or frames, depends very much on the management at this changeable season of the year. The plants now should only be watered when it is really necessary, and then the water used should be of the same temperature as the soil. With changing winds and outside temperatures it is difficult to keep the plants warm without sometimes getting them overheated, but that is necessary if early fruit and healthy plants, free from disease, are to be obtained.

Plants in frames that are overmoist and kept too close will be affected with "damping-off" diseases. These may not be very apparent until they are planted out, when a number will be found affected with "crown-canker" (*Sclerotinia*), &c., and a number of very unsatisfactory replacements have to be made. On most days some ventilation in the morning may be given to dry up the moisture that has become deposited on the glass overnight, and if the houses or frames are closed again in the afternoon before the temperature drops it should be satisfactory. This treatment is more easily given if the frames are situated in a sheltered, sunny, dry spot, as they should be. On the other hand, a cold draught blowing through the glasshouse for a few minutes at this season is very injurious. The plants are then soon chilled, become blue in colour, and growth is checked. They get over it to some extent with a little nursing, but time is lost and very often the bottom bunch of fruit also. The season so far has been unusually changeable, and it will be advisable in some districts to be ready with a little emergency heating for the glasshouse that is usually unheated, if a severe cold should threaten. If such weather occurs while the frames are in use they are easily protected by covering them with mats, &c.

Outdoor Tomatoes, Berries, &c.

Land for the outside tomato crop should be ploughed and prepared for planting out towards the end of October. Take advantage of dry weather to do this, and follow it up with light cultivation to destroy seedling weeds.

Berry bushes and plants should now be in good trim for another fruiting season. Light hoeing in fine weather will be their chief requirement.

Egg-plants and peppers are salad fruits which are being increasingly appreciated. Growers in the warmer districts might very well give them more attention. They should be sown now in boxes under glass.

Market-garden Work.

Seasonable sowings are lettuce, radish, spinach, turnips, and similar quick-maturing crops for any areas that may be available for a short period; also main-crop carrots, beet, and peas; and seed-beds of summer cabbage and cauliflower. Towards the end of the coming month in warmer districts dwarf beans and vegetable marrows may sometimes be included.

A piece of cool moist land should be prepared and reserved for sowing next month seed-beds for winter crops of leeks, celery, cauliflower, broccoli, and savoys.

The main work otherwise will consist of light cultivation and hoeing to destroy weeds. If this is attended to promptly during intervals of bright dry weather a great deal of labour is avoided. Thinning also is an expensive operation that may be greatly simplified by sowing crops with more judgment. They should be sown as thinly as possible. Most of us make the mistake of wasting seeds and making work by sowing these crops much too thickly.

The Home Garden.

Many spring-flowering shrubs in this section would be greatly improved and give a better display next season if they were given a little pruning attention now. Acacias and shrubs which flower on the young wood, such as forsythia, weigelia, and lilac, should have the wood which has flowered cut back to the buds at the base. The desirable young growth is then increased in quality and quantity. Heaths also would be benefited by having the dead flower-spikes removed.

House plants requiring to be repotted should now receive attention. The pots used should be quite clean; if they are new they should be soaked in clean water and allowed to dry superficially before they are used.

—W. C. Hyde, Horticulturist, Wellington.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

FIR AND PINE TREE TRIMMINGS FOR SHEEP.

"INQUIRER," Rangataua :—

An article recently appeared which stated that there was considerable medicinal value in trimmings from Douglas fir when fed to sheep. I would be glad to know to what extent this is correct, and also whether *Pinus insignis* would be as good.

The Live-stock Division :—

It is a common belief among sheep-farmers that trimmings from pine trees have a beneficial effect on the health of young sheep. The medicinal value, though small, is attributed to the turpentine these pine trimmings contain. Several farmers have been using pine trimmings for hoggets affected with parasites, with variable success. The small amount of turpentine contained in any variety of pines has a very questionable medicinal value as a cure for parasites, and cannot be recommended to replace other agents of proved reliability. *Pinus insignis* should be equal to Douglas fir in its turpentine content.

TOOWOOMBA GRASS.

"FARMER," Hastings :—

In your April number you give a description of *Phalaris tuberosa* L. (Toowoomba grass, Harding grass). Would you kindly let me know if it is possible to secure a small quantity of seed of this grass, and would it be suitable for sowing on light, dry land with a shingle subsoil. How does it compare with paspalum ?

The Fields Division :—

You would probably experience difficulty in purchasing seed at the moment in New Zealand. So far as we know there is none in the North Island. Mr. G. Craw, Linton, produces a quantity of seed annually, but last season this was all exported to Australia. *Phalaris* is not suited to light, shingly country, but requires a good, heavy, fertile type of soil. It cannot be compared with paspalum very well, as the latter requires heat and produces its maximum in the hot weather, whereas *Phalaris* produces its maximum in winter. It has been noticed growing vigorously in North Otago during heavy frosts.

TUNG-OIL TREES.

"SUBSCRIBER," Manutuke :—

Kindly inform me where I could obtain seeds of the tung-oil nut tree — if suitable for this district—and other information for growing.

The Horticulture Division :—

Seed of the tung-oil tree (*Aleurites Fordii*) was introduced into New Zealand by the Department of Agriculture a few years ago, and the trees planted out at Te Kauwhata Horticultural Station are now entering their third year. Growth so far has been good, but it remains to be proved if they will crop satisfactorily. It is possible the tree could be grown profitably on some of the poorer soils in the Gisborne district, but the tests now being made will go a long way in giving a good indication on that point. A firm in China offering seeds for sale is Messrs. Drysdale and Co., San Chia Wan, Nanking, China. They state : "The amount usually purchased is 250 lb. *Aleurites Fordii* and 250 lb. *Aleurites Montana ;* this is to ascertain which seed is most suited to the climate. The average price is approximately 45 cents ($0.45) Chinese silver currency (approximately 8d. sterling or 15 cents U.S. gold) delivered Shanghai, to which should be added about 20 per cent. for freight and charges to destination."

SEEDING OF SUBTERRANEAN CLOVER.

"R. M. S.," Winchmore :—

I purpose sowing some subterranean clover this coming season, and would like to know if it is likely to seed itself under intensive grazing conditions. I notice that under such conditions the sheep allow very few white-clover flowers to ripen seed, and I would like to know whether the same would apply to subterranean clover.

The Fields Division :—

Considerable interest is now being shown by farmers on the lighter types of soil in the establishment of subterranean clover. If the seed is sown in the autumn and the plants are not too heavily grazed the first season there is generally a considerable amount of seed produced. The seed is buried in the soil by the plant, and in places where it was sown two or three years ago the grazing of sheep does not appear to have greatly interfered with the seed-production of the plants and the renewing of the pasture annually by means of seedlings.

UNTHRIFTY STONE-FRUIT TREES.

"New Chum," Enfield :—

Could you tell me why my apricot and peach trees do no good. Every spring they just ooze clear gum from where leaves should come, and then turn black. There are only a few leaves on ends of twigs, and the rest of the branches are almost dead. The trees are five and six years old: Apricots, Oullens Early and Moorpark; peaches, Red May and Royal George.

The Horticulture Division :—

From the description given of your apricot and peach trees, they are evidently affected with fungous disease such as leaf-curl, die-back, or brown-rot. In any case they should be well sprayed with Bordeaux mixture as soon as the buds commence to move, and later during the summer with atomic sulphur or lime-sulphur. Before doing this the trees should be pruned, carefully cutting out all dead wood and shortening back the remainder rather hard, being careful to gather and burn the clippings.

BUCKWHEAT FOR BEES.

D. H. Burns, Napier :—

Having heard lately of beekeepers in the Nelson District for some years past providing a patch of buckwheat for their bees, I should be glad to know if the Department of Agriculture has had experience in this respect, and, if so, with what result. Also, if helpful, where could buckwheat-seed be obtained in small quantity suitable for sowing in a small home orchard?

The Horticulture Division :—

Buckwheat is a crop of only secondary importance and has been little grown here. Small experimental plots have done well, but the commercial prospects for the crop have not been good. If you desire to try the crop seed may be obtained from Messrs. Yates and Co., Seedsmen, Auckland. A small area is not likely to increase the honey-crop very appreciably. The advantage in this respect is obtained only when buckwheat is generally grown on the farms of a neighbourhood.

The Piripiri Parasite.—At last month's meeting of the Research Council the chairman stated that another attempt to introduce *Antholcus*, the piripiri parasite, from Chile, had proved only partially successful, the insect apparently requiring special care in transit. Dr. D. Miller, on his return to New Zealand via Chile, is to take a large consignment under his personal care in a further attempt to effect acclimatization.

WEATHER RECORDS: JULY, 1930.

Dominion Meteorological Office.

General Notes.

July, 1930, will be remembered for the very cold weather experienced, especially during the latter half. Southerly winds prevailed almost continuously, except for a short spell between the 17th and the 19th, and frequently reached gale force. Hail showers were numerous and widespread. The high country, also, received many falls of snow, which extended on several occasions to parts of the low levels. The falls in general were not heavy; indeed, on the ranges there is less than the usual amount for the time of year. Very seldom, however, has snow been so widely recorded as on the morning of the 28th. Between the 27th and 29th there were comparatively few places south of Auckland, except in Westland and parts of Nelson and Marlborough, which did not receive a few flakes. In many cases it was more than thirty years since snow had been seen previously.

Frosts were naturally numerous everywhere, and from Canterbury southwards there were few nights when they were not recorded. Temperatures were much below normal, several stations having experienced the coldest month on record. At many stations, however, 1895 or 1918, and in some cases 1901 and 1908, were colder.

Rain fell on more days than usual, but in most districts the total falls were considerably below average. The deficiencies were particularly marked in Nelson, Marlborough, and the interior of the South Island. Parts of North Canterbury and the Hawke's Bay, and a few isolated places elsewhere, received rather more than the normal.

During the first eight days of the month the weather, over most of the country, was the finest and mildest that had been experienced for some time. An anticyclone moved on to the Dominion on the 2nd and on the 4th became centred over the southern portion. It remained practically stationary in this position until the 8th, and clear skies and light winds were the rule. Such rain as fell came mainly in the night time. On the 5th and 6th there was fairly general rain, with many heavy falls in the districts about and south of Auckland.

Between the 8th and the 10th a small cyclone moved in a south-easterly direction past the northern extremity of the North Island. Rough weather was caused in the North Auckland, Bay of Plenty, and Gisborne and East Cape districts, and there were some heavy rainfalls. On the 10th, south-easterly gales reached as far south as Cook Strait.

On the night of the 15th to 16th, while an anticyclone was extending gradually over the Dominion, a slight depression developed over the central part of the North Island, and, passing eastward, was followed by a sudden and unexpected southerly gale. There were some heavy rains about Cook Strait, with numerous hail-showers and snow on the high country.

From the 17th to the 19th occurred the only spell in the month during which northerly winds prevailed. These were associated with a deep depression of the westerly type which moved eastward from Tasmania. Strong southerly gales and low temperatures followed on the 20th. On the 21st a cyclone developed from a secondary depression to the one just mentioned, and moved across the North Island to the Bay of Plenty. Southerly gales again set in on the 22nd. Between the 18th and the 22nd general rains fell, and the North Island, especially the eastern portions, recorded many heavy falls.

From this time onwards barometers remained low to the east of New Zealand while to the west they were high. Very disturbed conditions prevailed over the Pacific Ocean. Cold temperatures persisted, with frequent hail or snowfalls in some part or other of the Dominion. Southerly gales blew at intervals from the 25th to the 29th. On the 25th and the

28th they were particularly severe, and on the 28th occurred what was perhaps the most extensive fall of snow ever recorded in the Dominion. The amount was, however, in most places only small.

RAINFALL FOR JULY, 1930, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average July Rainfall.
	North Island.				
		Inches.		Inches.	Inches.
1	Kaitaia	2·45	17	0·78	5·96
2	Russell	..	..	..	4·97
3	Whangarei	4·83	20	1·37	7·26
4	Auckland	3·49	23	0·66	4·98
5	Hamilton	5·62	17	2·76	5·02
5A	Rotorua	2·82	13	0·60	4·89
6	Kawhia	4·17	17	0·77	6·16
7	New Plymouth	6·00	18	1·94	6·29
8	Riversdale, Inglewood ..	6·61	21	2·03	9·93
9	Whangamomona	4·73	12	1·78	7·35
10	Eltham	2·74	14	0·66	5·55
11	Tairua	3·54	9	1·08	5·25
12	Tauranga	8·53	14	2·56	4·86
13	Maraehako Station, Opotiki	1·76	13	0·48	4·09
14	Gisborne	4·07	19	1·35	5·14
15	Taupo	1·84	14	0·55	3·83
16	Napier	4·31	19	1·55	3·90
17	Hastings	4·37	17	1·10	3·66
18	Taihape	3·21	19	1·02	3·15
19	Masterton	4·29	21	0·93	4·31
20	Patea	2·01	14	0·69	4·20
21	Wanganui	2·01	9	0·95	3·52
22	Foxton	2·02	9	1·00	3·09
23	Wellington (Karori Reservoir)	4·16	23	0·66	5·22
	South Island.				
24	Westport	4·91	15	1·62	8·30
25	Greymouth	4·48	12	1·04	7·84
26	Hokitika	4·90	14	0·91	9·08
27	Ross	4·65	11	1·20	9·94
28	Arthur's Pass	4·35	2	4·17	11·55
29	Okuru, South Westland ..	8·61	12	1·58	12·03
30	Collingwood	..	..	..	9·65
31	Nelson	0·17	3	0·12	3·49
32	Spring Creek, Blenheim ..	0·59	6	0·25	3·40
33	Tophouse	2·02	8	0·50	4·79
34	Hanmer Springs	2·42	16	0·98	4·59
35	Highfield, Waiau	3·01	12	0·68	3·44
36	Gore Bay	2·90	15	0·75	2·84
37	Christchurch	2·93	20	0·77	2·76
38	Timaru	0·64	9	0·24	1·93
39	Lambrook Station, Fairlie ..	1·14	7	0·54	2·61
40	Benmore Station, Clearburn	0·61	8	0·27	1·73
41	Oamaru	0·52	9	0·18	1·74
42	Queenstown	1·03	10	0·28	2·04
43	Clyde	0·19	5	0·05	0·94
44	Dunedin	2·07	14	0·34	3·01
45	Wendon	1·81	12	0·35	1·79
46	Gore	2·53	17	0·69	1·94
47	Invercargill	2·76	22	0·40	3 28
48	Puysegur Point	4·95	19	0·75	6·18
49	Half-moon Bay	3·61	21	0·51	4·13

—Edward Kidson, Director of Meteorological Services, Wellington, 6/8/30.

VARIETIES OF APPLES AND PEARS PASSED FOR EXPORT, SEASON 1929.

THE following particulars of the varieties of apples and pears exported from New Zealand in the past season have been compiled by the Horticulture Division from export certificates. The figures for apples represent 1-bushel cases, and those for pears stand for crates consisting of three trays, each tray containing from 10 lb. to 12 lb. of fruit.

Apples.

Sturmer Pippin, 333,038; Delicious, 289,970; Jonathan, 257,500; Dunn's, 101,445; Dougherty, 63,138; Cox's Orange Pippin, 53,426; Statesman, 33,699; Ballarat, 16,623; Cleopatra, 15,819; London Pippin, 10,890; Rome Beauty, 10,268; Lord Wolseley, 9,310; Worcester Pearmain, 8,322; Rokewood, 7,893; Tasma, 5,645; Stayman's Winesap, 5,021; Newtown Pippin, 4,719; Premier, 4,682; Gravenstein, 4,533; Scarlet Nonpareil, 3,838; Granny Smith, 3,538; Salome, 3,198; Pioneer, 2,943; Adams Pearmain, 2,322; Alfriston, 2,074; Spitzenberg, 1,828; Celo, 1,699; Shorland Queen, 1,375; Stark, 1,266; Yates, 1,036; Parlin's Beauty, 1,003; King David, 926; Willie Sharp, 916; Blenheim Orange, 804; Hoover, 622; McIntosh Red, 619; Brighton, 569; Pride of Australia, 521; McMahon's White, 520; Stone Pippin, 498; Boston Russet, 444; Rymer, 435; Brownlee's Russet, 432; Simmonds Winter, 420; Crofton, 376; Baumann's Reinette, 339; McLiver's Winesap, 327; Winter Strawberry, 276; Ribston Pippin, 222; Cornish Aromatic, 173; Senator, 158; Mobb's Royal, 139; Giant Jeniton, 111; Golden Pippin, 102; Glengyle Red, 100; Scarlet Pearmain, 96; Washington, 95; Grooby Dessert, 89; Shepherd's Perfection, 89; Baldwin, 73; American Horn, 68; Edward Lippiatt, 54; Desert Gold, 42; Stansill, 40; Winter Banana, 40; Grime's Golden, 27: total cases, 1,272,824.

Pears.

Winter Nelis, 18,987; P. Barry, 13,012; Winter Cole, 10,328; Josephine de Malines, 3,397; Beurré Bosc, 2,683; Doyenne du Comice, 2,435; Packham's Triumph, 2,269; Keiffer, 1,697; Vicar of Winkfield, 1,297; L'Inconnue, 887; Beurré Clairgeau, 681; Beurré Diel, 565; Glou Morceau, 406; Beurré Capiamont, 240; Harrington's Victoria, 105; Beurré Easter, 86; Beurré D'Amanli, 85; Chaumontel, 49; Madam Cole, 48; Elizabeth Cole, 41; Beacon, 32; Winter Bartlett, 22; Bailey Berg, 21; Giblin's Nelis, 20; Broome Park, 7: total crates, 59,400.

Control of Red Mite on Apple-trees. — Mr. M. Davey, Orchard Instructor, Mapua, Nelson, reports: "Valuable results have been obtained during the past season in this district by the application of ordinary emulsified red oil at a strength of 1–150. It has been found that the application not only kills the adult insect, it also dislodges the deposits of eggs round the calyx of the fruit. The higher-priced summer oils do not appear to offer any advantages over the less costly winter oils, which do no harm to the fruit at a stage just prior to picking, while the colour of the fruit is brightened and made more clear, with possibly the advantage of oiled wrappers in the prevention of scald on susceptible varieties."

A new price-list giving particulars of supplies available from the Wallaceville Poultry Station has been issued, and may be obtained on application to the Department of Agriculture, Wellington. Sittings of White Leghorn and Black Minorca eggs are from 7s. 6d. per dozen, and of White Indian Runner ducks, 10s.; incubator lots, 6s. per dozen. Day-old White Leghorn and Black Minorca chicks are £1 17s. 6d. per 25, £3 10s. per 50, and £6 5s. per 100. Birds suitable for breeding purposes, and laying pullets, are also available. Orders (to be accompanied by remittance) and inquiries should be addressed to the Poultry Overseer, Wallaceville Laboratory Farm, per Private Bag, Wellington.

CERTIFICATION OF SEED POTATOES.

CERTIFICATES ISSUED ON TUBER INSPECTION, JULY, 1930.

Following is a further list of growers whose crops have been subjected to and have passed the final tuber inspection in connection with the system of Government certification of seed potatoes. Intending purchasers are referred to a list in the May *Journal* of growers who had received provisional certificates, giving the acreage and relative cropping-power of each line. Further lists will be published later.

Aucklander Short-top (N.Z. Sutton's Supreme).

Weeber Bros., Belfast.
F. Brundell, Kaiapoi.
J. Jellie, Russley Road, Fendalton.
W. E. Martin, E. Eyreton R.M.D.
G. Harris, Milford, Temuka.
A. J. Rich, Kaiapoi.
W. Oakley, Halkett.
D. Marshall, Killinchy R.M.D.
J. Rouse, Pareora, South Canterbury.
R. Barnett, Dunsandel.
T. O'Brien, St. Andrews.
A. D. Carroll, Southbridge.

Aucklander Tall-top (N.Z. Sutton's Supreme).

Weeber Bros., Belfast.
J. Warren, Russley Road, Fendalton, Christchurch.
H. S. Moore, Box 4, Kaiapoi.

Dakota.

H. M. Marshall, R.M.D., Weedons.
W. A. McPhail, Rakaia.
W. Gee, Springlands, Marlborough.
W. J. Crozier, Mitcham, Rakaia.

Epicure.

D. Marshall, Killinchy, R.M.D.
W. Shellock, R.M.D., Mead, Rakaia.

Robin Adair.

D. Marshall, Killinchy R.M.D.

Majestic.

A. J. Clarke, Rangiora.
C. H. Wilson, Lorneville, Invercargill.

Arran Chief.

G. Jones, "Vale Royal," Halswell.

Early Regent.

M. Kelly, 502 Lincoln Road, Halswell.

King Edward.

L. King, Rakahouka, Glencoe, R.M.D., Invercargill.

Iron Duke.

H. Hancock, Awahuri, Palmerston North.

Golden Wonder.

J. Warren, Russley Road, Fendalton, Christchurch.

GRADINGS OF BUTTER AND CHEESE, YEAR 1929-30.

THE Dominion quantities of butter and cheese graded for export by the Dairy Division during the twelve months ended 31st July, 1930 (the dairy industry year), were as follows:—

Butter: Salted, 93,734 tons; unsalted, 1,610 tons: total, 95,344 tons—an increase of 16·76 per cent. compared with the figures for the preceding twelve months.

Cheese: White, 57,689 tons; coloured, 29,564 tons: total, 87,253 tons—an increase of 0·74 per cent.

In butterfat equivalent the amounts for butter and cheese combined represent a net increase of 10·4 per cent. compared with those for 1928–29, hitherto the peak year. A new high-level record in annual butterfat production has thus been established.

Noxious Weeds Order.—The Castlepoint County Council has declared pennyroyal (*Mentha pulegium*) to be a noxious weed in that county.

EXPORTS FROM NEW ZEALAND FOR YEARS ENDED 30th JUNE, 1929 AND 1930.

Commodity.	Unit.	Quantity.		Value.	
		1928–29.	1929–30.	1928–29.	1929–30.
New Zealand Products.				£	£
Butter	Cwt.	1,567,393	1,817,799	12,744,992	13,022,957
Casein	,,	46,016	65,928	140,913	192,558
Cheese	,,	1,661,000	1,675,906	6,889,993	6,361,329
Fish	,,	24,741	22,766	86,077	79,974
Honey	lb.	2,565,795	607,581	89,241	20,772
Beef, frozen	Cwt.	509,738	328,474	808,266	577,120
Lamb, frozen	,,	1,879,680	2,014,702	6,925,831	6,884,717
Mutton, frozen	,,	961,247	1,021,146	1,949,919	2,042,301
Pork, frozen	,,	190,740	132,730	589,609	467,475
Other frozen meats	,,	111,185	150,483	229,692	281,282
Beef, salted	,,	2,365	2,442	5,284	6,630
Meats, potted and preserved	,,	53,495	31,758	198,323	143,277
Sausage-casings	lb.	3,574,661	4,200,707	688,098	779,651
Milk, preserved	,,	2,060,813	2,621,990	49,069	56,864
Milk, dried	,,	16,083,585	10,746,152	361,625	285,837
Peas	Cental	143,817	153,311	112,623	101,700
Oats	,,	25,466	4,569	13,373	2,323
Apples, fresh	lb.	32,171,840	56,211,770	447,509	724,595
Hops	,,	282,979	314,681	15,942	16,235
Potatoes	Ton	1,056	1,596	8,298	13,007
Live-stock	..	..	..	117,710	121,267
Calf-skins	Number	741,923	649,783	300,197	201,298
Hides, horse and cattle	,,	355,490	273,914	677,552	374,646
Rabbit-skins	,,	11,278,431	8,257,869	555,811	315,198
Opossum-skins	,,	152,430	156,675	102,812	102,461
Sheep-skins, with wool	,,	1,179,788	1,207,604	464,303	333,515
Sheep-skins, without wool	,,	8,729,575	9,762,632	1,473,253	1,336,524
Wool	Bale	687,833	553,298	15,923,157	8,156,309
Phormium fibre	Ton	13,620	10,245	371,520	273,778
Seeds, grass and clover	Cwt.	55,935	43,955	172,621	167,781
Tallow	Ton	21,352	22,118	719,099	686,261
Coal	,,	177,343	157,430	247,228	215,568
Kauri-gum	,,	4,517	4,891	247,094	257,964
Gold	Ounces	120,506	132,313	495,456	544,999
Silver	,,	434,501	512,148	43,288	46,110
Leather	..	..	..	16,206	8,722
Timber, sawn	Sup. ft.	37,617,329	38,255,654	408,158	426,505
Other products	..	..	..	598,265	593,547
Total	..	..	..	55,288,407	46,223,057
Re-exports	..	..	..	956,343	1,365,156
Total exports	..	..	..	56,244,750	47,588,213

Commenting on the figures, the Census and Statistics Office states: "The principal cause of the recession in 1929–30 is found in lower wool-prices, the declared value being £7,766,848 less than that for 1928–29, representing a decline of 36 per cent. per bale exported. The quantity shipped receded by 134,535 bales, this decrease, however, being mainly due to the fact that a considerable portion of the clip had not been disposed of at the end of the production year."